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An Inspiring Achievement

YEAR after year, in city after city, the central-station company issues a financial statement for the information of its stockholders. Usually this statement consists of an abstract of the president's annual report, followed by the treasurer's list of assets and liabilities. To the average stockholder it is about as interesting as an ancient Assyrian inscription.

Only the accountant has understood these cryptic communications, published because the law compels it. But the interesting human story of the organization, its plans and its accomplishments, has not been told. At last, however, the inspiration has come. The Commonwealth Edison Company, shaking off the hobbles of tradition, has shown the way.

ON THE evening of Feb. 27 there were gathered together in Chicago about 1,500 customer-stockholders of the Commonwealth Edison Company. There they were, that mysterious throng that most executives have thought of so impersonally. President Samuel Insull talked to them there and to the other 23,000 absent shareholders, waiting to read about it in the morning papers.

He told them all about their company—what it has been doing, its organization, its properties, its plan. Other officials talked. The men of the company looked upon these men and women in the audience, and the stockholder *en masse* became more of a human personality. The shareholders received from them a human picture of the corporation, an easy understanding of its possessions, achievements, prospects and ideals.

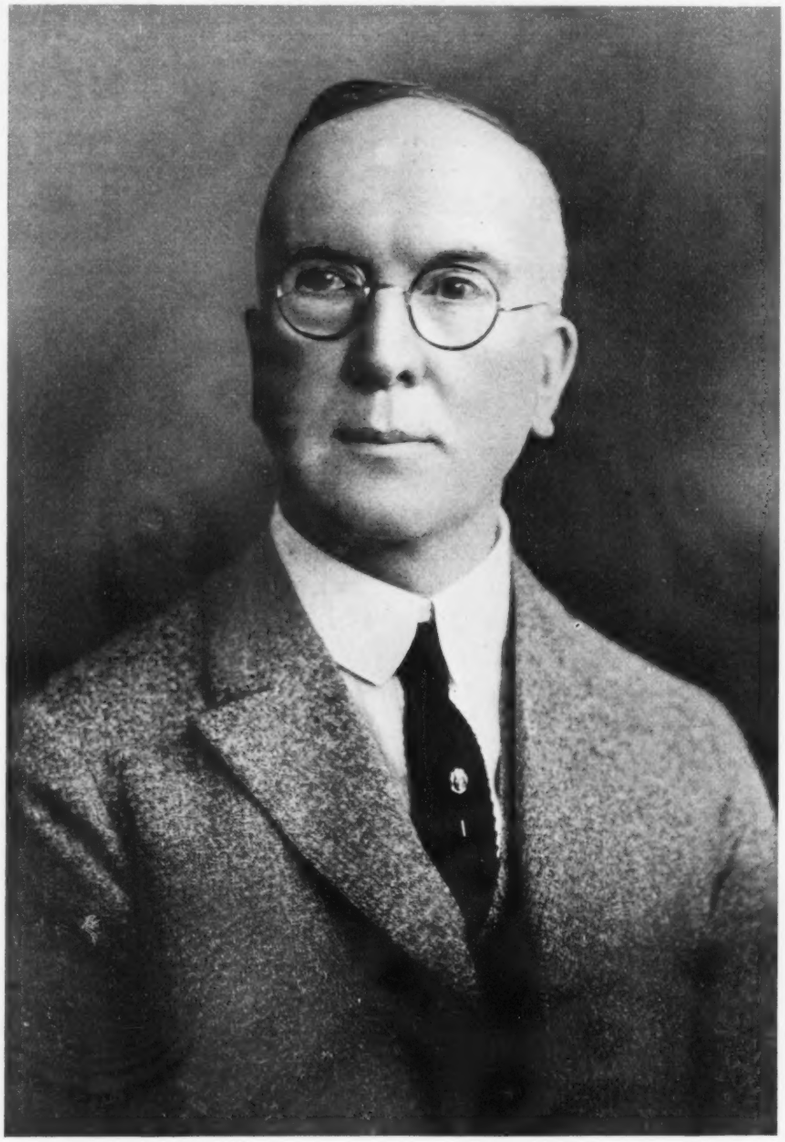
The company then published and distributed among all its stockholders, not a cold, repelling tabulation of statistics, but a "Year Book" to carry by pictures and the printed page the same kind of a human story that the meeting provided through a personal contact. In it you find Mr. Insull's address and an intimate message concerning the Commonwealth Edison Company, so pungent with interesting facts and ingenious diagrams that it reads like a romance. Then comes the financial statement, each item clear in its meaning. How this is done is told on another page.

In short, the Commonwealth Edison Company has succeeded in discovering itself to its 24,571 stockholders by simply picturing itself in terms of common understanding.

ALMOST every utility corporation in the land is suffering today for want of this kind of an interpretation to the public and its customers. But up to now men have not hit upon the way to do it. The National Electric Light Association can render no greater service to the industry than to reprint this Commonwealth Edison "Year Book" and place it in the hands of central-station executives. It shows the way.

Thomas Duncan

A pioneer in the development of the electric meter, an inventor of prominence and a business leader.



THAT the electrical industry has made such rapid progress is largely accounted for by the fact that precise measuring instruments were early available. These meters gave accurate data on which to base estimates or to analyze performances. Even though ignorant of electrical theory, the ordinary business man early appreciated an accurate measuring instrument, gained confidence from its indications and was able to gage more accurately the value of his investments.

Thomas Duncan is one of the few men who have seen almost the entire development of the electric meter and been in intimate touch with all of its phases. He is both a maker and an inventor, for he holds upward of 200 patents on electrical instruments and is the owner and organizer of a large meter-manufacturing establishment. Among the most important of his contributions to this branch of the art has been the invention of a light-load-compensating device for maintaining light-load accuracy by compensating for the increase in friction brought about by an increase in the service age of meters.

The magnetic shield was introduced in meters by Mr. Duncan between the magnets and the series field coils to eliminate induction effects. He also built the first model of an alternating-current meter which had an aluminum-disk armature for both the motor and the retarding element. Bearing practice also received a decided stimulus from the contributions of Mr. Duncan, as he was the first to disclose, by patent, the present upper bearing used in alternating-current meters.

Born and educated in Scotland, Mr. Duncan first took up pharmacy, but with an eye on the electrical industry, then in its infancy. He came to America in 1883, seeking employment of an electrical nature, but it was not until the fall of 1886 that opportunity offered and he entered the works of the Sun Electric Company, Woburn, Mass., which then manufactured lamps, transformers and alternating-current generators. In 1887 he became connected with the Fort Wayne (Ind.) Jenney Electric Light Company and engaged in the manufacture of incandescent lamps and in 1890 entered the meter department of the Thomson-Houston Electric Company at Lynn, Mass., and became familiar with the two types of meters then marketed.

In December of the same year he returned to Fort Wayne to take charge of the meter-testing department of the Fort Wayne Electric Light Company. In 1893 several meter patents were granted to him. His first meters were put on the market in 1894.

In 1898 Mr. Duncan became meter engineer for the Siemens & Halske Electric Company of America and designed a complete line of alternating-current and direct-current watt-hour meters. After the General Electric Company absorbed the Siemens-Halske Company he organized the Duncan Manufacturing Company and, in 1901, began manufacture at Lafayette, Ind. He first produced direct-current meters and later, as business increased, developed a line of alternating-current meters and transformers. The work of Mr. Duncan will always be a milestone in the progress of the electrical industry, and his name ranks high in the list of its pioneers.

Mr. Duncan is a member of the American Institute of Electrical Engineers, the Franklin Institute of Philadelphia, the American Electrochemical Society and the American Association for the Advancement of Science, as well as a director in several of the leading industrial corporations of Lafayette.

Editorial Comment

Electrical World, July 1, 1922

Volume 80 Number 1

The Threatened Railroad Strike and the Coal Supply

BECAUSE of the reduction in wages ordered by the United States Labor Board, certain minor groups of railroad employees threaten to strike on July 1. Ballots have been distributed, and the vote is now being tabulated and counted. What the effect of a railroad strike at this hour will be time only can tell. That it will add to the troubles of electric public utilities is a foregone conclusion. All utilities throughout the country have been severely handicapped because of the long-continued coal strike, but fortunately the electric light and power companies have heeded repeated warnings and have managed to store sufficient coal to carry them over a strike of a few months. More enterprising companies have in addition added to their coal piles by judicious purchases from time to time and will thus be able to guarantee service for a longer period. The public, while it may appreciate such foresight, is more concerned in getting service and takes it for granted that all necessary steps to safeguard the service have been taken.

Coming on top of the three months' coal strike, a railroad strike will of necessity bring with it serious difficulties. We are certain, however, that there are enough skill and ingenuity in the electric light and power companies to meet and overcome these difficulties. So far, despite the coal strike, the record for electric service has been admirable. That the industry will weather a railroad strike just as successfully as it did the coal strike we are confident. Certainly nothing should be left undone to maintain the record for service so creditably established.

Forester Employed to Supervise Tree Trimming

ONE of the most troublesome and perhaps one of the worst mishandled of public utility problems in the routine of every-day work is that of trimming trees. Ordinarily the trimming is left to a line crew, whose only interest is to clear away as many obstructions as the state of mind of the property owner will permit. The knowledge of forestry possessed by the crew is usually a minus quantity. The result is too frequently a butchery of the trees and trouble with the public.

Last fall the Public Service Company of Northern Illinois brought a crew of technical experts in from a neighboring state. All the men were skilled foresters, and the leaders were known to be particularly skilled. The crew took entire charge of the work even to obtaining the necessary permits from individual owners and the municipalities. The result was so satisfactory that a trained forester has been added to the operating staff to assume entire charge of the tree-trimming problem. Whether this is the first instance of the employment of an expert in this capacity by a central-station organization is not definitely known. Several other cases have been noted where the step has been discussed and some cases where men who have some qualifications for the work have been employed temporarily.

The tree-trimming situation is constantly becoming more acute with the spread of lines to rural territory, and the practice of planting "memory" trees along highways is gaining enough ground to indicate that it may accentuate the problem in a comparatively few years. Where electric systems cover a wide spread of territory in which trees are a factor in line operation, the employment of specialists in forestry to handle tree trimming is well worth consideration.

The Assassination of Walter Rathenau

AN INTERNATIONAL leader in the electrical industry was removed when Walter Rathenau was assassinated in Berlin last week. His political and economic fame, while it eclipsed his success in the electrical industry, did not so completely overshadow it as to dim its glory. The Rathenaus, Walter and his illustrious father, Emil, were among the most conspicuous figures that industrial Germany has produced within the last two generations. Whether as manufacturers, industrial organizers or financiers, their fame reached beyond the borders of Germany and was worldwide.

First Emil, who was the founder of the powerful Allgemeine Elektricitäts Gesellschaft, backed by the most prominent and best organized banks of Germany, started to corral the electrical business of Europe, Asia, Africa and South America. There was practically no important city or large commercial and industrial center in the world outside of North America in which the "A. E. G." had no branch. The variety of its output exceeded even that of the General Electric Company of this country, and there were approximately sixty enterprises which were more or less closely associated or had entered into commercial agreements with it.

The elder Rathenau freely owned his indebtedness to America for many of his organization ideas. He visited this country at the time of the Centennial Exposition and returned to Germany determined to apply American methods to German business. To some it even appeared that he went us one better. His son, Walter, while he enlarged upon the work of his father, was different in inclination and temperament. The elder Rathenau was fundamentally an engineer and showed all the constructive genius of the engineer in welding together the great organization over which he presided. Walter Rathenau was primarily an organizer, manager and economist. His view of industry was much broader than that of his father. This was particularly shown in

his relations with employees. He did not follow the German traditions of master and servant, but sought to democratize his organizations. His foremen were given a degree of freedom unknown under his father, but were held accountable for results. None regretted his severance from the company about a year ago, when he accepted a government portfolio, more than the employees of the "A. E. G." Germans probably will revere his name for his services to the Fatherland both during and after the war. This phase of his life's work naturally does not commend itself in as great a degree to citizens of countries with which Germany was at war. Nevertheless his efforts to get the Germans to live up to treaty obligations, particularly reparations, won for him commendation and respect outside of his own country. The assumption is that this work cost him his life.

Men connected with the electrical industry, however, are not so much concerned with the political activities of Walter Rathenau. They have watched with interest and admiration his work in handling and strengthening the great organization handed down to him by his father, and while their loss is not personal, they recognize that one of the outstanding electrical men of the world, one who has reflected glory on his industry and on his country, is now no more.

Will California Heed Its Own History?

HEGEL is credited with the statement that "history teaches us that the people never learn by history." Certainly the average man either knows little of history or disregards its plain teachings, and as for the politician he feels that history is all "bunk." This fall California is to vote on a water and power act involving the expenditure of the stupendous sum of five hundred millions as the minimum. With this appropriation the state plans to acquire all of the water and power rights within its borders and to embark on state socialism. People wonder and ask: "Has California gone mad? Is there any state in the Union that owes more to private initiative and enterprise, and particularly is there any state in which electricity under private ownership and public regulation has worked such marvels?"

Yet this would not be the first time that California has engaged in socialistic work. From 1885 to 1903 the state published and actually prepared the textbooks for its common schools. The textbooks were almost without exception poorly written and poorly printed, and so expensive was the experiment and so bad its effect on public education that in 1904 the Perry amendment to the constitution, annulling the law, was ratified by popular vote. Now, although textbooks must be manufactured within the state, the text need not be prepared in California. In spite of the great influx of population from the Middle West, there are those still living in that state who can vividly recall this incident, and it is hardly likely with its effect in mind that they will commit the state to another socialistic venture, the probable outcome of which would be more disastrous to the community than the previous escapade in the preparation and publication of school textbooks. Unfortunately to a large part of the population of California the history of the commonwealth is a closed book, and it is expedient that these be quickly and properly informed. It is hardly likely that any one who considers for a moment the enormity of California's obligation to its privately owned utilities for its growth and productivity would ever vote to permit the state to socialize these industries.

City Zoning Affords a Central-Station Opportunity

THE central-station industry can well afford to take an intelligent interest in the city zoning movement. Zoning is intended to restrain a city from "keeping its gas range in the parlor and its piano in the kitchen." It means the application of common sense and fairness to the public regulations governing the use of private real estate. It is a painstaking, honest effort to provide each district or neighborhood, as nearly as practicable, with just such protection and just such liberty as are sensible in that particular district. It avoids the error of trying to apply exactly the same building regulations to every part of a city or town regardless of whether it is a suburban residence section or a factory district or a business and financial center. It fosters civic spirit by creating confidence in the justice and stability of the protection afforded.

Because zoning is a good thing for the city it is a good thing for the public utility that serves the city, and every central-station executive in an unzoned town should post himself upon the purposes and trend of the movement and get behind the idea. The utility suffers many losses in the decadence of so-called blighted areas which zoning will prevent in the future. But there is another point of far greater importance. Zoning influences competition through setting up better standards of housing and better standards of living, and higher standards inevitably bring greater utilization and consumption of electricity.

European and American Cable Ratings

ARE high-voltage cables manufactured abroad superior to those produced in this country? When we consider the vast amount of attention and expense devoted by American engineers and manufacturers to the important problem of cable design and the experience gained from the enormous amount of cable in service, and when we recall the group of striking papers of a year or so ago describing research in all phases of the problem, an affirmative answer to the question above can hardly be expected. Yet frequently figures of rating and performance appear from the other side of the ocean which at least raise the question anew.

The most recent instance is the report, now available, of the international conference on large electric systems held in Paris last November, particularly the report of the committee on cables and its discussion. Figures are given from most of the European countries which are most striking in the matter of voltage rating. It will be recalled that conservative American opinion expressed within the last two years placed the limiting working stress in cables at 25 kv. per centimeter, with some advocates of an even lower value, and that this led to the conclusion that 35 kv. was about the limit of voltage so imposed when taken in relation to the size of available duct. Corresponding figures from the reports referred to show as common values 40 kv. to 60 kv. per centimeter for the maximum stress, and from 50 kv. to 60 kv. as the rating of three-

phase cables guaranteed by the manufacturer. For single-conductor cables rated at 100 kv. and above are mentioned.

Two explanations of these differences between American and European practices suggest themselves. The first is in the matter of temperature. In the reports referred to 50 deg. C. is the conservative maximum permissible temperature mentioned. Discussion on this side, however, reckons on base or surrounding temperatures of 40 deg. C. and contemplates maximum temperatures of 75 deg. or more. Obviously, the higher the operating temperature the lower must be the voltage rating, and based on a maximum temperature of only 50 deg. C., American ratings could easily be substantially advanced.

A second possible explanation may lie in a greater conservatism of American engineers. The position taken by the advocates of a low-voltage gradient is that by this means ionization losses and hot spots will be excluded from the greater proportion of cables, recognizing the while that many single cables may come through which will stand up to much higher service. As is well known, reports are frequently heard of cables operating at unusually high voltage over long periods. Good and poor cables of the same manufacture and type will appear under the most careful attention to design, assembly and installation, and so long as this is the case it appears to be the opinion here that it is unwise to base the permissible maximum voltage gradient on the better cases. It would be more advisable to take due account of the general level of quality in specifying the maximum voltage at which cables shall operate.

Getting Down to Real Facts on Steel-Mill Electrification

NEARLY all steel men agree that the quantity of raw material and the direct labor required to roll a ton of steel is less with motor-driven rolls than with engine-driven rolls. Moreover, the electric drive has operating advantages such as more uniform torque, greater flexibility, smaller space requirements, reduced maintenance and repair cost and reduced power consumption, and, still further, it makes possible an accurate cost-accounting system through the use of electric meters.

On the other hand, the capital investment for motor drive is greater than that for steam drive. Hence when replacements are considered the item of capital looms large as the critical item in the decision and the question is frequently decided on the basis of first cost alone. However, there are many intangible benefits affecting cost that should also be considered, such as convenience, control, safety, flexibility, overload capacity and the fewer delays due to breakdown. If all these elements are considered, most of the doubts which may remain regarding the economy of replacing existing steam-driven mills with mills driven by electric motors will be removed.

Too frequently conservatism or the lack of accurate cost and operating data has handicapped the progress of electrification, and it is significant that we are able to present in the article by G. E. Stoltz in this issue some cost data from the highly competitive steel industry. Trade cost data are not essential secrets, and in fact, if kept under cover, they handicap progress and prevent economy.

Longer Spans as a Means of Cutting Rural Service Expense

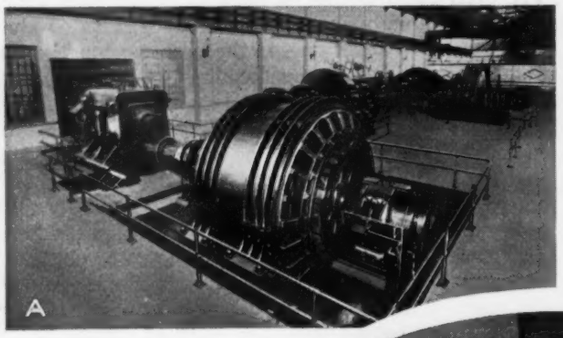
IN THE construction of rural or other lines reaching into territory where the mechanical loads on the line structures are small one of the practices on the Pacific Coast that lead to lower first costs is the use of long line spans. Spans up to average lengths of 300 ft. with No. 6 hard-drawn copper conductors are not uncommon, and practice in a great many instances is based on the use of spans averaging 250 ft. for entire lines or territories. Even longer spans have been used where copper-clad steel and taller and heavier poles are employed. Not only is the first cost in poles and insulators and all the items going into the construction reduced, but in the case of the higher-voltage distribution lines the reduced number of insulators means also a reduction in the cost of insulator maintenance.

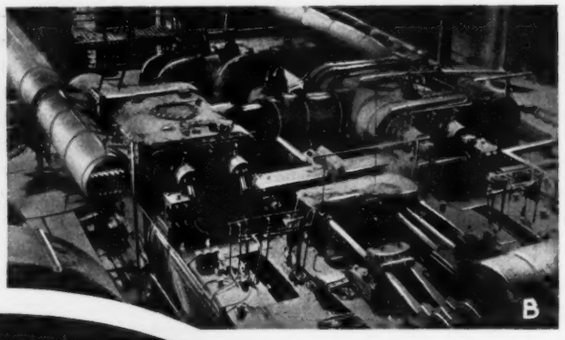
There has been a strong feeling that this practice could not be extended to the territory in the Middle West and the East, where climatic conditions are more severe. Last year, however, the rural-lines committee of the Empire State Gas and Electric Association boldly broke the bonds of precedent and put forth a specification that provided for long-span construction. New York State has some extremely severe winter conditions, but the committee found that a proper selection and arrangement of construction materials would permit the use of spans at least up to 250 ft. when the loads did not exceed the few conductors found on the average rural line. In several instances where new lines are being constructed in the Middle West this lead is being followed, and before the year is over a considerable mileage of such lines will undoubtedly be in operation.

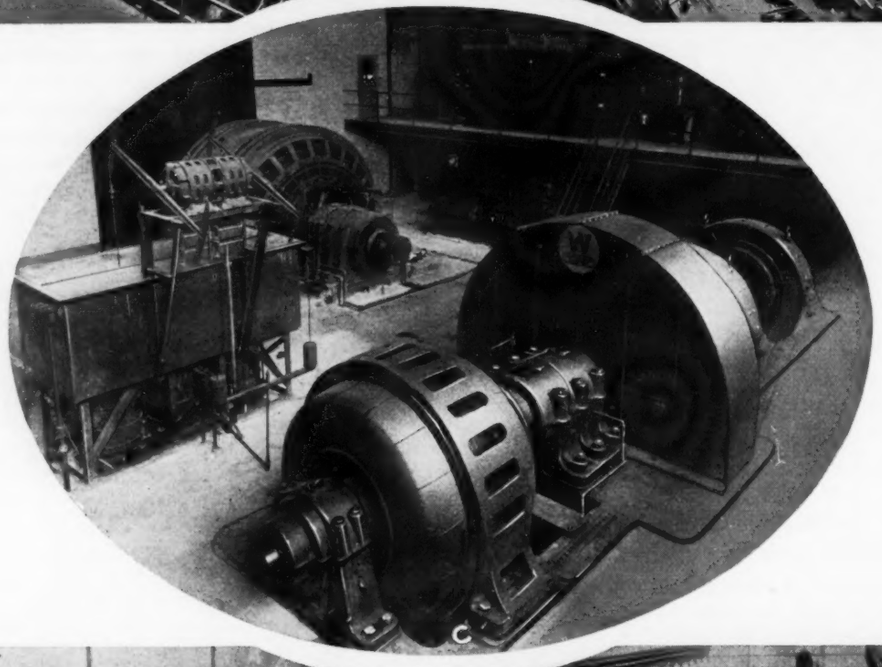
If the engineer has only light loads to handle and is willing to spend a little time on design studies, he will find a rather wide latitude in the exact type of construction while still staying within the limits of his structural and conductor stresses. When smaller conductors are used, the controlling conditions are those of the sag and of the conductor spacing required to prevent swinging contacts. Of course, the saving in the cost of poles and other line materials resulting from the use of long spans must be balanced against the excess cost of longer poles and cross equipment and the cost of heavier conductor fastenings. But careful study will reveal the possibility of materially increasing the span lengths over present Eastern and Middle Western line practice on a large mileage of new construction without unwarrantable increase of the unit stresses on either conductors or supporting structures.

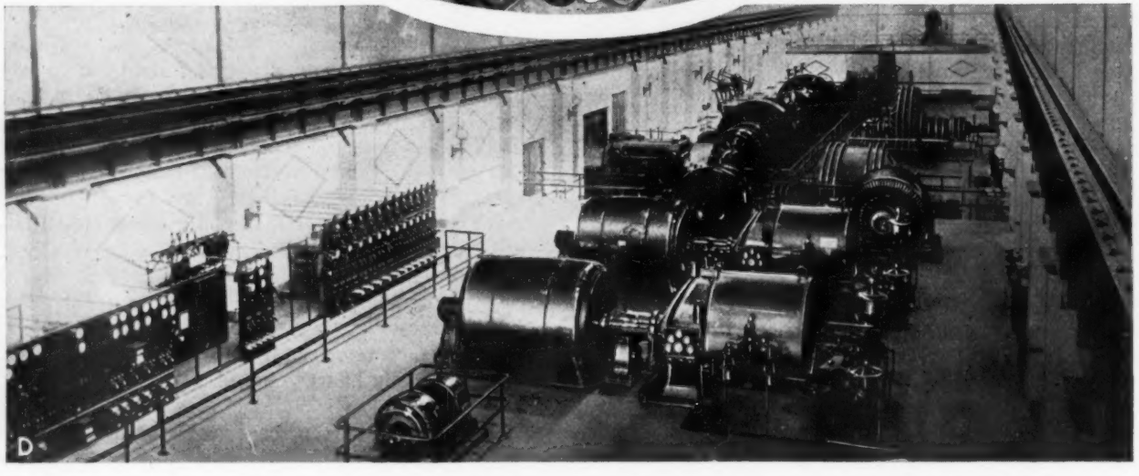
Another fact revealed by the Empire State committee is that it is easy to provide for situations where heavy lines later develop by choosing proper span lengths so that new poles may later be set to split the long spans in two when the heavier lines do develop. Heretofore, with most of the earlier construction work in the territory east of the Rocky Mountains, the certainty of a line's developing into a heavily loaded pole line has been great enough to make the use of long spans a doubtful expedient except on heavy high-tension transmission lines. But the development of large mileages of lightly loaded rural lines that is apparently ahead changes the situation, and for such lines long-span construction designed for more severe climatic conditions has become a real need.

Successful Performance of Steel-Mill Duty Is Sufficient Recommendation of Motor Drive for Any Industrial Application









CONTINUED application of motor drive to steel rolling mills which have had an opportunity to compare it with steam drive for output, continuity of service, flexibility of control and cost of operation should be the highest recommendation of electric drive that any one can expect. Additional support for this type of motive power will be found in the detailed performance data presented in the following pages.

In these data there is a lesson for more than the man who is interested in steel mill applications. The figures bespeak the value of electric drive in an industry which cannot be surpassed for severity of duty, importance of continuous operation and necessity of flexible control and economy. If more data of this kind could be pried loose from secrecy in this and other industries it would do more for progress than probably any other one thing.

Three electrified steel-mill installations which are justifying themselves are shown in the accompanying illustrations: In the foreground of A is a 40-in. reversing blooming mill; in the background is a 28-in. structural mill motor. B shows a steam-engine driving a 35-in. reversing blooming mill of the Atlanta (Ga.) Steel Company. This was replaced by the motor and flywheel-generator set in C. The motor room of the Inland Steel Company, Chicago, is illustrated in D. In the foreground are two 5,000-kw. turbo-generators and two 1,000-kw. motor-generator sets. Behind them is the driving equipment for a 40-in. reversing blooming mill, a 34-in. roughing structural mill and a 28-in. finishing structural mill.

Steel Rolled for Less on Electric Mills than with Steam Drive[1]

Records Show that Steam Mills Can Often Be Replaced by Electric Mills with Marked Advantages—Accurate Cost Accounting Is Possible with Electric Mills, and Labor and Maintenance Costs Are Reduced

By G. E. STOLTZ

Engineer in Charge Steel Mill Division Westinghouse Electric & Manufacturing Company

A NUMBER of important electric installations have been made in steel mills to replace the steam engine. While in some cases the steam engines were replaced because they were worn out, there are many cases where the change was made in order to obtain better economy and produce steel more cheaply than was possible with the steam drive. Records which have been taken indicate that the operating cost of producing steel by electric drive is one-half to one-third that of production by steam drive. Among the contributing factors to this economy are the lower cost of power itself, lower standby expenses, lower maintenance costs, and consequently less delay and better opportunity for measuring the power consumption and thus checking any faults which may develop in the equipment.

[1]The data on which this discussion is based have been presented at meetings of Association of Iron and Steel Electrical Engineers.

From the tables presented here and from other data it is shown that the operating cost of electric drive is considerably less than that of steam drive. Comprehensive records of costs of electrical operation prepared by E. S. Jefferies, electrical engineer with the Steel Company of Canada, are given in Table I. According to these figures the power and main-drive operating cost averages less than 17 cents per gross ton of steel on the blooming mill. The values are averages for the years 1913 to 1919 inclusive on a 34-in. reversing mill. In Table II and Table III the costs for electric drive are 0.253 cent and 0.225 cent. These costs compare very favorably with the costs shown in Tables IV, V and VI for steam drive, which are respectively 0.617 cent, 0.717 cent and 1.179 cents per gross ton. A comparison of these figures agrees very closely with the conclusions of Mr. Siebert, combustion engineer with the Bethlehem Steel Company, and Mr. Eppelschimer, chief engineer

Tables I to III—Power and Main-Drive Operating Cost of Rolling Steel Electrically

34-IN. REVERSING BLOOMING MILL
Ingots, 15 x 17—4,200 lb. Blooms, 8 x 8; 6 x 6; 4 x 4.

Year	1913	1914	1915	1916	1917	1918	1919	Average
Months in operation	9	8	12	12	12	12	8	10.43
Tonnage*	119,230	92,622	174,460	238,050	297,224	276,778	155,515	†18,800
Kilowatt-hours	23.9	22.8	21.5	19.8	20.4	21.8	23.4	21.2
Power cost	0.1600	0.1530	0.1440	0.1330	0.1370	0.1460	0.1570	0.1445
Repairs and maintenance	0.0069	0.0092	0.0045	0.0102	0.0039	0.0030	0.0027	0.0058
Miscellaneous supplies	0.0045	0.0049	0.0025	0.0025	0.0029	0.0015	0.0051	0.0030
Labor in operation	0.0141	0.0161	0.0128	0.0100	0.0128	0.0147	0.0146	0.0132
Total cost	0.1855	0.1832	0.1638	0.1557	0.1566	0.1652	0.1794	0.1660

35-IN. REVERSING BLOOMING MILL
Ingots, 20 x 20—6,800 lb. Blooms, 8 x 6; 4 x 4; 5.5 x 22

Month	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Year					1919					1920	
Tonnage*	13,441	15,467	18,738	28,049	26,733	11,402	10,658	20,808	26,965	30,461	27,160
Kilowatt-hours	25.5	23.6	22.2	22.1	22.1	25.5	18.4	20.8	19.9	19.9	21.4
Power cost	0.2300	0.2130	0.2000	0.1980	0.1980	0.2300	0.1880	0.1790	0.1790	0.2340	0.2570
Repairs and maintenance	0.0013	0.0012	0.0010	0.0006	0.0007	0.0016	0.0017	0.0009	0.0007	0.0006	0.0007
Miscellaneous supplies	0.0026	0.0023	0.0020	0.0012	0.0013	0.0030	0.0033	0.0017	0.0013	0.0013	0.0013
Labor in operation	0.0350	0.0305	0.0250	0.0168	0.0176	0.0412	0.0440	0.0226	0.0175	0.0154	0.0191
Total	0.2689	0.2470	0.2280	0.2166	0.2176	0.2748	0.2370	0.2042	0.1985	0.2513	0.2781

Month	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for
Year					1920						1919–20
Tonnage*	35,598	28,286	31,087	34,938	35,941	32,813	33,072	35,648	32,836	30,043	†26,700
Kilowatt-hours	19.3	22.3	22.6	20.3	20.6	23.1	19.2	21.0	18.8	18.0	21.3
Power cost	0.2310	0.2680	0.2710	0.2430	0.2470	0.2770	0.2300	0.2520	0.2260	0.2160	0.2320
Repairs and maintenance	0.0006	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007
Miscellaneous supplies	0.0010	0.0012	0.0011	0.0010	0.0010	0.0011	0.0011	0.0010	0.0011	0.0012	0.0014
Labor in operation	0.0146	0.0183	0.0167	0.0148	0.0145	0.0158	0.0157	0.0145	0.0158	0.0172	0.0186
Total	0.2472	0.2882	0.2894	0.2594	0.2631	0.2945	0.2474	0.2681	0.2434	0.2351	0.2530

40-IN. REVERSING BLOOMING MILL
Ingots, 22 x 24—9,600 lb.; 25 x 25—11,500 lb.; 25 x 30—13,500 lb. Bloom, 6 x 6; bloom, 8 x 10

Month	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Average for
Year	1919		1920										1919–20
Tonnage*	12,334	23,878	31,956	31,902	40,192	16,375	32,175	37,363	33,434	20,838	32,750	10,741	†27,500
Kilowatt-hours	20.7	21.4	21.0	20.6	20.2	22.9	18.7	20.1	18.4	20.0	16.6	18.1	19.6
Power cost	0.2030	0.1780	0.1420	0.1870	0.2100	0.3200	0.2130	0.1780	0.1930	0.2600	0.2010	0.2540	0.2020
Repairs and maintenance	0.0125	0.0060	0.0000	0.0030	0.0050	0.0190	0.0010	0.0020	0.0000	0.0010	0.0020	0.0030	0.0035
Miscellaneous supplies	(Cost for this item included with "Repairs and Maintenance" above)												
Labor in operation	0.0210	0.0210	0.0190	0.0160	0.0190	0.0180	0.0190	0.0180	0.0190	0.0190	0.0190	0.0150	0.0188
Total	0.2370	0.2050	0.1610	0.2060	0.2340	0.3570	0.2350	0.1980	0.2120	0.2800	0.2220	0.2720	0.2250

*Finished tons (2,240 lb.) on the blooming mill. †Monthly average tonnage finished on the blooming mill over the entire period. All costs are based on cost per ton (2,240 lb.) of steel produced.

of the American Rolling Mill Company. The data submitted by Mr. Siebert indicate that a steam-driven mill requires two and one-half times the steam that would be required for electric drive, and from Mr. Eppelschimer's test the net steam required is three and one-half times that required by electric drive.

The tables show that the average cost of attending the electrical equipment is 1½ cents per ton, and that for the engine-driven mill it is 4 cents per ton. This labor covers that required in the motor room or on the engines themselves and does not include the pulpit operator. This charge applies to the main-drive equipment only, including the flywheel, reversing motor, switchboard control, exciter and blower for electric drive, and the engine itself in case of steam drive. Usually the motor room has other apparatus over which the same motor operator has supervision, so that not all of his time can be charged against the reversing equipment. In some cases the electric drive, because of its control features, eliminates one of the three men required on a mill.

A big advantage of electric drive is the difference in the cost of repairs, maintenance and supplies. On electric drive these average ½ cent per ton, while on engine drive they total 5 cents per ton. The fact that it costs ten times as much to repair and maintain an engine is an indication that the delay incurred is considerably greater for steam drive and emphasizes the

Tables IV to VI—Power and Main-Drive Operating Cost of Rolling Steel with Steam Drive

35-IN. REVERSING BLOOMING MILL

42-in. x 60-in. geared twin simple engine exhaust into low-pressure turbines. Ingot, 18 x 20—5,500 lb. Bloom, 4 x 4.

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Year						1918						
Tonnage*	13,783	22,175	28,756	29,576	30,680	29,080	29,846	28,314	25,347	29,246	26,765	27,538
Steam per ton	1,645	1,155	1,055	1,015	1,015	1,010	1,035	1,100	1,100	1,065	1,085	1,052
Power cost	0.7140	0.5200	0.4080	0.4500	0.4260	0.4140	0.4150	0.4650	0.4780	0.5100	0.5200	0.4780
Repairs and maintenance	0.0513	0.0201	0.0156	0.0099	0.0074	0.0177	0.0225	0.0155	0.0244	0.0277	0.0870	0.0657
Miscellaneous supplies	(Costs for this item included with "Repairs and Maintenance" above)											
Labor in operation	0.0498	0.0411	0.0280	0.0316	0.0311	0.0310	0.0303	0.0351	0.0369	0.0422	0.0413	0.0412
Total	0.8140	0.5712	0.4416	0.5806	0.4645	0.4627	0.4679	0.5156	0.5393	0.5799	0.6483	0.5849

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Year						1919						
Tonnage*	30,078	19,491	16,379	14,567	15,790	14,988	16,488	14,616	10,529		20,625	23,839
Steam per ton	1,010	1,240	1,415	1,435	1,520	1,270	1,023	1,382	1,010		1,100	1,165
Power cost	0.4870	0.6210	0.7520	0.6800	0.6780	0.5450	0.4530	0.5320	0.4340	*Net*	0.6070	0.6130
Repairs and maintenance	0.0282	0.0717	0.1387	0.3421	0.0749	0.0751	0.0114	0.0208	0.0376	*Operating*	0.0255	0.0266
Miscellaneous supplies	(Costs for this item included with "Repairs and Maintenance" above)											
Labor in operation	0.0388	0.0497	0.0532	0.0630	0.0571	0.0518	0.0482	0.0471	0.0520		0.0454	0.0410
Total	0.5540	0.7424	0.9439	1.0851	0.8100	0.6719	0.5126	0.5999	0.5236		0.6779	0.6800

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for
Year						1920							1918-19-20
Tonnage*	28,493	27,683	31,295	19,962	22,859	25,731	26,306	26,716	25,403	29,081	29,924	28,958	†24,000
Steam per ton	1,040	990	950	1,085	1,170	1,110	1,048	1,070	1,111	1,020	1,005	1,050	1,040
Power cost	0.5940	0.4970	0.5310	0.5930	0.4840	0.5000	0.6000	0.6310	0.5580	0.5660	0.6370	0.6770	0.5350
Repairs and maintenance	0.0270	0.0298	0.0371	0.0377	0.0282	0.0205	0.0232	0.0358	0.0420	0.0231	0.0467	0.0281	0.0394
Miscellaneous supplies	(Costs for this item included with "Repairs and Maintenance" above)												
Labor in operation	0.0367	0.0414	0.0389	0.0497	0.0465	0.0412	0.0429	0.0420	0.0444	0.0382	0.0387	0.0400	0.0397
Total	0.6577	0.5682	0.6070	0.6804	0.5587	0.5617	0.6661	0.7088	0.6444	0.6273	0.7224	0.7451	0.6170

36-IN. REVERSING BLOOMING MILL

50-in. x 66-in. twin simple engine exhaust into low-pressure turbine. Ingot, 22 x 24—9,600 lb. Bloom, 8 x 8

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
						1919						
Tonnage*	40,600	34,963	34,334	27,167	31,723	33,706	38,049	39,427	25,197	15,720	30,960	33,196
Steam per ton	1,632	1,578	1,564	1,709	1,790	1,747	1,619	1,413	1,692	2,624	1,680	1,683
Power cost	0.5070	0.4770	0.5320	0.5460	0.5310	0.5320	0.4850	0.4240	0.5230	0.9000	0.5810	0.6690
Repairs and maintenance	0.0800	0.0890	0.0950	0.0440	0.0570	0.0960	0.1190	0.0910	0.1650	0.0720	0.1140	0.1280
Miscellaneous supplies	(Costs for this item included with "Repairs and Maintenance" above)											
Labor in operation	0.0280	0.0260	0.0280	0.0290	0.0280	0.0290	0.0270	0.0290	0.0340	0.0600	0.0410	0.0340
Total	0.6150	0.5920	0.6550	0.6190	0.6160	0.6570	0.6310	0.5440	0.7220	1.0320	0.7360	0.8310

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec	Average for
Year						1920							1919-20
Tonnage*	33,008	31,779	38,695	36,446	36,221	34,422	34,015	40,903	35,349	35,160	31,411	18,763	†32,900
Steam per ton	2,018	1,781	1,591	1,650	1,623	1,575	1,736	1,557	1,616	1,566	1,495	1,813	1,690
Power cost	0.7020	0.6940	0.6850	0.6710	0.6340	0.6940	0.8050	0.6530	0.7460	0.6230	0.8250	0.9200	0.6350
Repairs and maintenance	0.0150	0.0400	0.0140	0.0080	0.0120	0.0210	0.0180	0.0060	0.0180	0.0420	0.0140	0.0440	0.0427
Miscellaneous supplies	(Costs for this item included with "Repairs and Maintenance" above)												
Labor in operation	0.0390	0.0400	0.0340	0.0350	0.0360	0.0380	0.0380	0.0330	0.0350	0.0380	0.0380	0.0380	0.0339
Total	0.7560	0.7740	0.7330	0.7140	0.6820	0.7530	0.8610	0.6920	0.7990	0.9030	0.8770	1.0020	0.7170

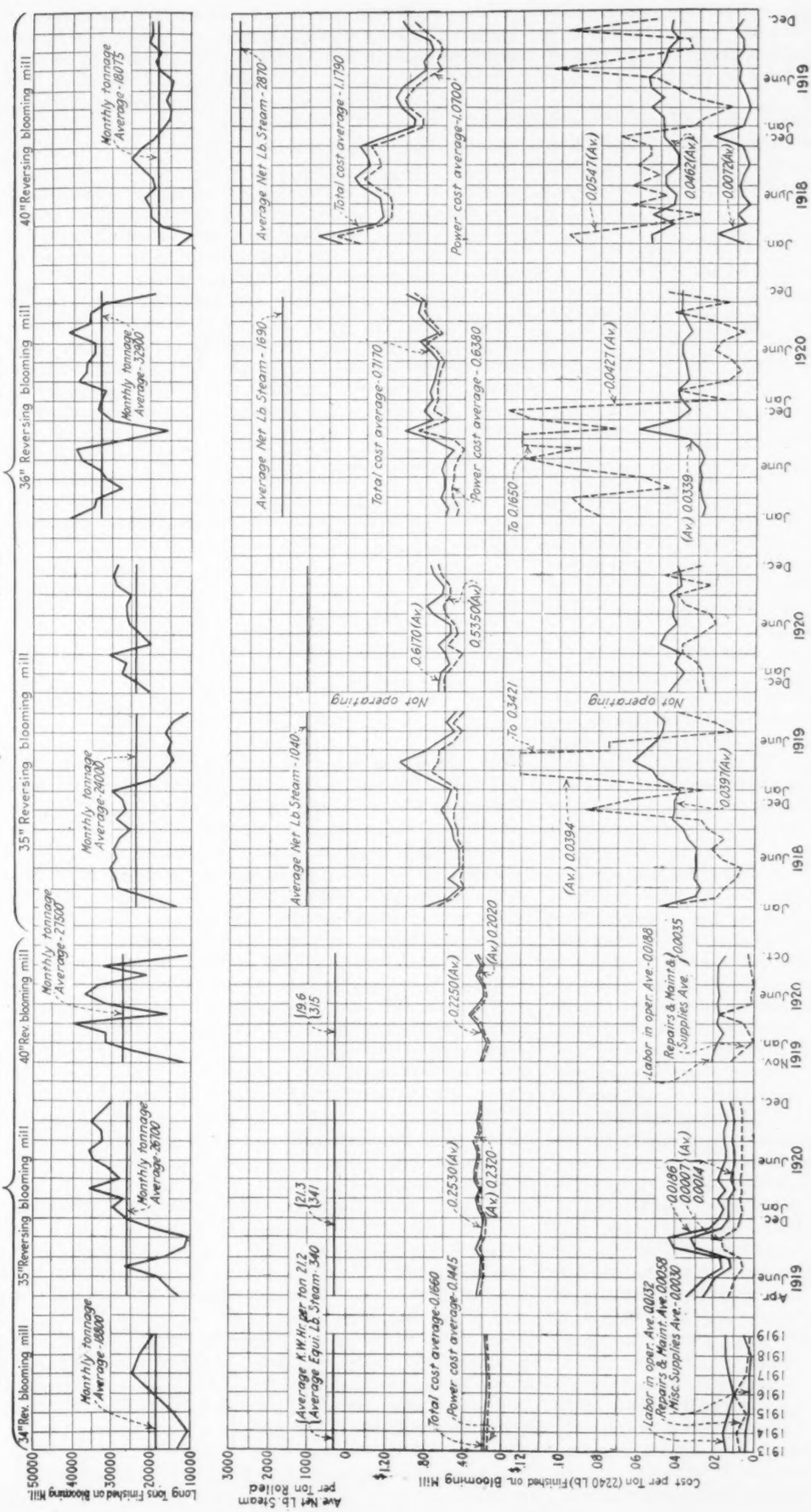
40-IN. REVERSING BLOOMING MILL

50-in. x 60-in. twin simple engine exhaust into low-pressure turbines. Ingot, 18 x 20—5,000 lb. Bloom, 7 x 4.

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Year						1918						
Tonnage*	13,450	10,283	17,325	19,868	19,808	21,380	18,961	19,708	22,172	25,040	22,319	18,929
Steam per ton	2,800	4,030	3,400	3,580	3,530	3,700	3,790	3,400	2,810	3,050	3,200	2,870
Power cost	1.4500	1.7300	1.2400	1.1550	1.1550	1.1750	1.3500	1.4400	1.2750	1.3000	1.3600	1.1500
Repairs and maintenance	0.0895	0.0960	0.0507	0.0290	0.0640	0.0465	0.0640	0.0503	0.0611	0.0538	0.0502	0.0691
Miscellaneous supplies	0.0070	0.0201	0.0055	0.0095	0.0035	0.0079	0.0090	0.0071	0.0039	0.0061	0.0068	0.0129
Labor in operation	0.0535	0.0539	0.0418	0.0537	0.0425	0.0415	0.0470	0.0470	0.0400	0.0400	0.0430	0.0480
Total	1.6000	1.9000	1.3380	1.2472	1.2650	1.2789	1.4700	1.5444	1.3800	1.4000	1.4600	1.2800

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
Year						1919							1918-19
Tonnage*	16,712	15,088	14,774	15,808	14,755	14,026	17,767	18,657	17,422	20,278	19,544	19,717	18,075
Steam per ton	2,515	2,500	2,930	2,820	2,830	2,330	2,110	1,920	1,890	1,950	2,410	2,530	2,870
Power cost	0.8400	0.8350	0.9720	1.0150	0.9500	0.8220	0.6440	0.7000	0.6500	0.6830	0.8300	0.9350	1.0700
Repairs and maintenance	0.0330	0.0261	0.0122	0.0343	0.0440	0.0535	0.1035	0.0618	0.0330	0.0351	0.0962	0.0513	0.0547
Miscellaneous supplies	0.0075	0.0052	0.0033	0.0050	0.0075	0.0093	0.0085	0.0097	0.0068	0.0069	0.0113	0.0075	0.0072
Labor in operation	0.0474	0.0480	0.0542	0.0475	0.0545	0.0552	0.0490	0.0465	0.0053	0.0400	0.0443	0.0433	0.0462
Total	0.9479	0.9143	1.0417	1.1018	1.0560	0.9400	0.8050	0.8180	0.7351	0.7650	0.9818	1.0371	1.1790

* Finished tons (2,240 lb.) on the blooming mill. † Monthly average tonnage finished on the blooming mill over the entire period.
All costs are based on cost per ton (2,240 lb.) of steel produced.



fact that electrical equipment requires very little Sunday work in comparison with that necessary on the steam engine. The variation in power cost resulting from working below rated tonnage is shown in Table VII. The first mill, which is the one showing the smallest increase in power cost per ton under light-load conditions, purchases central-station power. The reason for the low cost is that practically all stand-by losses are eliminated. The second mill listed, which also has a low power cost under small output, is supplied with power from a generated station installed in the mill, which furnishes energy to all the auxiliaries of the mill as well as to a number of large motor-driven mills each working in a large measure independently of the others. This makes it possible to diversify the loads on each mill, and when production on any one mill is suspended the stand-by losses of this mill are eliminated. When this mill stops, the amount of steam being generated in the boiler will be too great; but since this is part of a rather large assembly of mills, the full effect is not felt, as the demand of this mill is diversified with that of other units so that the total generating capacity is by no means equivalent to that of the connected capacity. A higher cost for low rate of production is shown for the third mill listed. This mill is supplied by generating equipment devoted almost exclusively to this

Relative Costs of Rolling Steel

The accompanying graphs are plotted from actual data obtained with three motor-driven and three steam-driven reversing blooming mills (see Tables I to VI). The monthly average tonnage rolled is shown at the top, while the equivalent steam per ton is indicated below. Total cost, power cost and itemized operating expenses per ton finished constitute the two lower sets of curves. In all these characteristics the motor-driven mill excels the steam driven.

and another electrically driven mill, the operation of which is dependent upon the first mill. In this case delays are costly because it is impossible to take advantage of the diversity factor obtained where electrification is more complete.

Although the power cost of the mill as shown in Table III indicates quite a saving over a steam-driven mill, it is evident that complete advantage has not been taken of electrification. The full merits of this method are not realized until all individual steam units with their steam lines and boilers are removed and the entire plant is electrically driven from a generating station which will in a large mill have one-third the rating of the connected load. Such an installation also makes it possible to meter all energy accurately, which cannot be done in a plant where part of the steam is utilized in steam engines driving main rolls.

Table VII—Significant Facts Taken from Tables I to VI

Item	Minimum Tonnage In Percentage of Average	Maximum Power Cost per Ton In Percentage of Average	Power Cost per Ton In Percentage of Total
1	60	111	87
2	40	119	92
3	40	158	90
4	43	140	87
5	49	141	88
6	55	161	91

The fourth mill listed is an engine-driven mill, but the operation is fairly constant. Credit is given the engine for the exhaust steam to the low-pressure turbine, and as there are a number of other steam-driven mills in this plant which roll independently of each other, the load on the boilers is diversified. The fifth and sixth mills shown are also engine-driven. No credit has been given to the fifth engine for the exhaust steam to the turbine, as it is sometimes necessary when the engine is not in operation to feed high-pressure steam into the turbine. The last mill shown could easily produce a greater tonnage than the average recorded. Credit is given to the last engine for exhaust steam which is used in low-pressure turbines. The steam cost is high on this mill, not only because a small tonnage is produced, but also because the demand for steam by this mill and another steam-driven mill in tandem with it forms a large part of the total load on the boilers.

It is interesting to note that the power cost in case of both steam and electric drive averages 90 per cent of the total operating cost. This is shown by the last column of Table VII. The mills represented in Tables III and V roll approximately the same product and are subject to the same method of accounting. They roll the same maximum tonnage, although the demand on the electrically driven mill has not been so regular as that on the steam mill. The difference in cost for rolling on these two mills is 50 cents per ton in favor of the electric mill, which on the basis of 30,000 tons per month would result in an annual saving of $180,000. This would easily pay for electrifying the steam mill, including the necessary boiler and generating equipment, in four and one-half years.

There is considerable satisfaction in knowing that the power consumption on the electrically driven mills is accurately measured, including all incidentals. In many instances there is too great an inclination to underestimate the losses incidental to steam-engine operation which in practice cannot be determined.

The use of motor drive not only enables the operating engineer to keep accurate accounts of the cost of power, but also enables him to detect the influence of various methods of operating the equipment and the effect that any modification in the machinery itself may give. In addition it allows the detection of faults which may develop in the equipment. The influence of such things may be small, but the possibility of detecting these small differences is responsible in a large measure for the advance in economy which has been obtained by electric drive. The absence of this feature has been a great drawback to the improvement in the economy of operating mills with engine drive.

To show the speed with which electric drive may be substituted for steam, it may be well to cite the instance of changing over the 44-in. reversing blooming mill of the Steelton plant of the Bethlehem Steel Company. In this mill operation was resumed with the motor just twenty-four days after the engine rolled its last steel.

Some might argue that, even though operating charges favor the electric drive, fixed charges favor steam drive. R. B. Gerhardt has considered an isolated reversing blooming mill and tabulates first costs as follows:

	Steam Drive	Electric Drive
Boiler plant, including connections to engine	$500,000	.....
Electric power plant, including boilers, turbines, wiring, etc., complete	.....	$660,000
Engine drive, twin-tandem compound with condenser	200,000	.....
Motor drive, complete	.....	450,000
	$700,000	$1,110,000

With interest at 6 per cent, depreciation at 6 per cent and insurance and taxes at 3 per cent, the total fixed charge is 15 per cent. This would give $8,750 per month for the steam and $13,875 per month for the electric drive; assuring a monthly tonnage of 25,000 on either type of mill, the fixed costs per ton would be $0.35 on the steam and $0.555 on the electric. Adding these to the highest average operating costs for electric drive and lowest average operating costs for steam drive gives figures of $0.808 per ton for electric operation and $0.967 per ton for steam operation.

S. Kneass, Jr., has compared electric and steam drive on a 46-in. x 60-in. twin-tandem compound unit. From data obtained on the unit the cost of the steam based on 600 lb. per ton, with coal at $5.60, will be 30 cents. On the assumption that this is about 77 per cent of the cost, the total cost is 39 cents per ton. A motor drive doing the same work is assumed to use 1 kw.-hr. per ton, and at ¾ cent per kilowatt-hour the cost of the electric drive would be about 19 cents per ton of steel rolled to seven elongations. The advantage of the electric drive on a yearly output of 600,000 tons would be $120,000. If the motor drive is assumed to cost $500,000 and fixed charges are put at 15 per cent, the net saving of steam drive where replaced by motor drive would be about 11 per cent.

A 35-in. electrically driven blooming mill of the Sharon Steel Hoop Company has been in operation about three years and uses from 20 kw.-hr. to 22 kw.-hr. per ton of steel rolled at a cost of about 30 cents per ton. The mill rolls 20-in. x 22-in. ingots to a maximum section of 15-in. x 4-in. and a minimum of 4-in. x 4-in. and has turned out as high as 675 tons in a single eight-hour run.

How to Sustain Security Selling

What to Do When Stock Selling Begins to Fall Off After the Opening Campaign—Pressure Selling and Contest Selling—Guiding the Workers—Problem of Permanent Selling

By PERCY H. WHITING
Manager Securities Department Central Maine Power Company

AFTER the first enthusiasm for the new idea of security selling has passed, it is natural in every organization that interest should lag, the pressure of selling ease up and the volume of securities sold fall off. What should be done when that time comes? Plenty of people willing to buy will be found if they are properly approached and influenced. How can the attention of the employees be held to the purpose and made continually productive? Mr. Whiting has undertaken to answer these questions in this article, out of his experience in helping to organize and operate customer-ownership security sales for many central-station companies. In a former article, published in the *Electrical World*, April 22, 1922, he told how to conduct the initial campaign that introduces the securities of the local utility to the community. In another article to follow he will carry this thought still further in a discussion of how to maintain security selling on a permanent basis. It will appear in an early issue.

SELLING preferred stock through employees to customers in any considerable volume has this disadvantage: That it is up-hill all the way. The longer you keep at it the harder it gets. The reasons are that:

1. Many customers will buy stock only once—because they do not want all their money in one pocket.

2. Many are people of small means. Their funds are a shallow financial reservoir which, once drawn off, refills but slowly.

3. Employees sell first to the people they know. They start off like the "flash" insurance agent who sells to his friends and then gets another job. And while a few employees learn to sell, more of them don't—and their interest and enthusiasm rapidly wane.

Therefore, if a company sells only a relatively small amount of stock at any one time, it may sell easily for years. But, on the other hand, if it sells relatively large amounts of stock, it may soon find it necessary to increase the intensity of its effort in order to keep up the volume of sales.

TWO WAYS TO SELL

To put additional pressure on flagging employees and keep the volume of sales up after the first enthusiasm aroused by employee selling has died away two methods may be followed. You may use spurs or you may stir the enthusiasm of employees by getting them into a stock-selling contest.

The most effective way of applying the rowels is to obtain a recognition by employees of the fact that stock selling is company work. If this plan is to succeed, the general manager or the general superintendent or both must be 100 per cent believers and must themselves see that the "pressure" is applied.

This "pressure" method has worked. If from the start of company stock selling employees are subjected to propaganda to convince them that "selling is company work," many of them will drop into the scheme willingly and sell quite a little stock.

I have seen this plan both work and fail. In a small way several companies have put it over successfully. I know another company of fair size which has used it with steadily decreasing success. This company sold its first five thousand shares in a month, its second in six months, and is now floundering along on the third five thousand, with chances good that it will take six years to dispose of them. My own judgment is that flagging enthusiasm can best be stimulated by making a big contest or game out of stock selling. This can be done by offering many prizes, by pitting one district against another and one employee against another, by arousing a spirit of competition.

Before going into the detail of handling stock-selling contests, it might be well to mention some forms of stimulation that apply in either "pressure" or "contest" selling:

1. *Train your employees to be better salesmen.* This can be done by meetings, by correspondence and by correspondence courses. And remember that what you teach your employees about selling will profit you in more ways than merely the disposal of preferred stock. If employees understand the basic principle of salesmanship (which is "service"), they will be better employees. If they can be taught that their job is to "sell" the company to the public in all their dealings, they will iron out many wrinkles.

To teach your employees to sell, use a house organ. If your company is big enough, get out a weekly publication. If your company is smaller, get out stock-selling bulletins. You can get good material out of sales magazines, correspondence courses, books on salesmanship and matter published by the N. E. L. A. Write a brief correspondence course on selling your stock and send it out to all who are interested.

2. *Increase the number of employees who sell.* You will perhaps never get all your employees gunning for stock "prospects," but the more employees you interest the more stock you sell. Keep a list of employees who have never sold stock and work on them by letter or in person. Send lists of the laggards to department heads and get them to act as missionaries.

3. *Widen the field of prospects* by doing away with the restriction that you will sell to customers only. Sell to any one—in the territory or out.

4. *Put field managers to work.* Such men can work personally among employees, stimulate their interest, show them how to sell, close difficult sales and do much to produce results.

5. *Increase advertising.* This applies both to newspaper and direct-by-mail advertising.

Newspaper advertising is the very backbone of successful selling of securities through employees. A diagram published in the *Electrical World* some months

Publicity Matter Used to Sustain Employee Enthusiasm and Activity in Stock Selling to Customers

The Exciter
CENTRAL MAINE POWER COMPANY
AUGUSTA, MAINE

The Contest Has Started Have You

The Race is on. Now for the

The Exciter
CENTRAL MAINE POWER COMPANY
AUGUSTA, MAINE

STOCK SELLING RECOGN
AS PART OF EMPLOY

SELLING ABILITY OF EMPLOYEES URGES PLAN

HERE'S THE NEW
EMPLOYEE S

The Exciter
CENTRAL MAINE POWER COMPANY
AUGUSTA, MAINE
November 26, 1921

COMPANY ANNOUNCES BIG NEW CONTEST

It's "Up to You" As Never Before

This stock contest now starting is a test of loyalty.

We haven't asked you to "sell stock" or do any impossible thing.

We have given you a task within the powers of any man or woman in our organization.

To see ten people in ten days and tell them ten simple points.

Just that and nothing else.

If you will do it, if every company employee will do it, WE SHALL GO OVER OUR QUOTA.

Don't worry about the other fellow.

Will YOU do it?

"Ten Points" to Tell Every Customer

[1]

Our company is offering for sale a 7 per cent preferred stock. That is, this stock pays $7 a year a share, or $6.50 a year on each $100 you invest. It pays its dividends quarterly.

[2]

The company is offering this preferred stock to its customers in the first place because it has use for investment money, and in the second place because it believes in customer-ownership.

[3]

I believe this stock is safe and that it will always pay dividends. I believe this for a good many reasons. First, it is a legal investment for Maine savings banks, and is owned by three and by quite a number of banks and trust companies. Secondly, because the company is growing steadily and its earnings are increasing. Third, because the company owns property that would cost, it is estimated, considerably over $25,000,000 to replace. Fourth, the company is under the jurisdiction of the Public Utility Commission of the State of Maine. Fifth, the company has paid dividends on its preferred stock for over eighteen years—sixty dividends without interruption. Sixth, the company is managed and owned by Maine people. Seventh, the company has 41,000 customers, and takes in over $3,000,000 a year in gross earnings.

[4]

If you put your money in this stock, it is not only safely invested, but it is set to work developing Maine. It is largely used to develop and distribute power. This development of power tends to bring factories to Maine, and this helps us to get lower taxes and greater prosperity.

[5]

All of the money you put into this stock stays right here in the State of Maine.

[6]

Every cent of it goes directly or indirectly into property; dams, power houses, and pole lines, all right here in the State of Maine.

[7]

The stock is exempt in Maine from all state, county, city, and town taxation. It is exempt from the Federal Income Tax up to the surtax.

[8]

This stock is no trouble at all to the man who owns it. He gets a dividend check four times a year. The rest of the year he doesn't even have to think about it. If you own our stock you don't have to put your certificate in the safe deposit box. If it burns up you go right on getting the dividends. By going through certain formalities, you can get a new certificate.

[9]

If you need to get your money out of the stock the company will help you.

[10]

Stock brought now should steadily go up in value. If your prospect is a person who might want to buy on easy terms, tell him. You can buy on divided payments if you wish, $10 down and $10 per month per share. If you own stock yourself, or if you are buying it, say: I am one of over 220 employees of the company who now own this stock or are buying it. We all believe in the stock and the company.

We Are Proud of

Our Employees

CENTRAL MAINE POWER CO.

CENTRAL Maine Power Company is proud, for more reasons than it would be modest to enumerate, of its employees.

They are all human and hence liable to error; but taking them by and large, year in, year out, their equal would be hard to find for loyalty, for efficiency, and for willingness and ability to give service to the public day and night, summer and winter, storm or fair weather.

Not the least of our reasons for being proud of our employees is the success they have each year in selling the preferred stock which finances the development of Maine water powers.

Our employees—linemen, station operators, meter readers, clerks and all the rest—sold last year more than 2,000 shares of stock.

They expect to complete the selling before this year ends, of 3,000 shares.

This method of selling by employees to customers adds, we feel sure, to the friendship between company and customers. It brings to employees and customers alike a realization of the needs of plowing in Maine money here at home—the need for the development of Maine's great resources—water power.

Since the future of Maine means much to you and since you must know some Company employee through whom you can put some of your savings at work building up the old home state, why not place your order for preferred stock at once?

Any employee can take your order. The price is $107.50 a share, the yield 6½% net.

Central Maine Power Co.

Augusta, Maine

HAVE WE ASSIGNED YOU CORRECT POINT RATING?

Find Your Name in This List and See If You Are in the Right Class. If You Are Not Classified Correctly Let the Securities Department Know

Would You Like a Little Intimate Infor
on the 7 per cent. Preferred Stock
Central Maine Power Company?

Book of Facts About Giving Customers An Opportunity To Buy Central Maine Power Co. 7% Preferred Stock

Interior view of Skowhegan Station

Company Employees
st Hand Facts

of Central Maine Power Company,
ntative but an employee engaged in a
soon to tell you something about M
our opportunity to profit thereby.
ee can tell about the Company from the
our questions about the
its securities and can, if you
ur order for Central Maine
pany 7 per cent. Preferred

Now before you
about buying will y
the facts about M
Company and how i
with yours? Just turn

BOOK OF FACTS

HOW TO OPEN YOUR SALES TALK

TELL YOUR PROSPECT THESE TEN POINTS

C. M. P. Co.

C. M. P. Stock is, in Many Ways, Superior to Bonds

Consider Well These Points of Superiority

Central Maine Power Company

CONSIDER that in comparison with bonds, our preferred stock is far more desirable, that while public utility bonds are taxable, that it may fairly be considered a permanent investment (because the company's policy is opposed to calling it, no matter what price it may reach) while so many bonds have a low call price and are likely to be called just as soon as money conditions return to normal, consider that our stock is likely to increase considerably more in price than bonds. Consider also that in buying our preferred stock you deal direct with the company and get your money at work at once on its task of building Maine.

It such a sincere appeal to you, why not place your

ago showed the advertising of the Pacific Gas & Electric Company in relation to the company's stock sales. When advertising was increased sales went up; when advertising was decreased sales immediately fell off; when there was no advertising there were virtually no sales.

That sales vary directly with advertising has proved true with us. In the first few months of our stock selling we made steady gains. Then sales began to fade. The situation cost me sleep at nights. Then I took account of stock and found that, in the hurry of building up a stock-selling organization, I had been neglecting to write and place the usual amount of advertising. We rushed out some copy to the papers and almost magically brought our sales up to the average again. Since that time whenever sales have fallen off we have for a while doubled up on our advertising. In summer, when the security business is supposed to wither up, we do more advertising than in winter and are thus able to harvest sales the year round.

Another valuable form of advertising is direct-by-mail advertising—letters, booklets, circulars, folders, broadsides. If a series of good mailing pieces are sent to prospecting customers, the work of the salesmen is lightened.

6. *Hold employee meetings.* If rightly conducted, they both teach and stimulate.

7. *Get up "prospect" lists.* Most undirected employee selling is random work. If it is systematized, it makes better results.

PROSPECT LISTS ARE VITAL

The value of prospect lists was exemplified in a New York State sale in which one district put it over all the others. We investigated and found that while employees in other districts were calling without plan or system, the superintendent of the successful district had gone over his customer cards and had prepared a list of good prospects. These he had passed out to the employees, who called on the prospects whose names were given to them, and on no one else. In consequence there was no crossing of wires and a much larger volume of sales.

In the preceding paragraphs have been given some of the possible sales stimulators for those who use "pressure." If you decide to stimulate flagging interest by conducting a selling contest or the "prize" method, I recommend the following plans that have been used successfully:

OUTLINE FOR SELLING CONTEST

1. *Length of contest.* Our experience is that the more contests you have the longer each succeeding one has to be—up to a limit of perhaps six or eight weeks. We find that now and then, when a contest is going strong, we can even push the closing date along for two or three weeks. Don't do it so often, however, that it becomes a habit.

2. *Preliminary announcements.* Since enthusiasm and the contest spirit must be aroused, much depends on getting the story graphically before the employees. Use your house organ, if you issue one weekly. If not, use letters, folders, broadsides or some mailing piece (I am assuming your company is so big that you cannot get your employees together without considerable trouble and expense). This advertising to employees will tell them why you are selling stock and what they get out of it. If the company is small, you can best accomplish the results by meetings.

In the preliminary announcement you will tell employees about:

(a) *Quotas.* Each employee and each district or department should have a quota. The individual quota is based on what you feel each employee has a fair chance to sell. The district quota is the sum of the quotas of the individuals.

(b) *Commissions.* As interest in selling dies down it frequently pays somewhat to increase the commissions. I have had good success with a commission of $1 per share for the first ten shares, $1.25 from eleven to twenty, $1.50 for twenty-one to thirty, $1.75 for thirty-one to forty and $2 for all over forty shares. We pay also an extra 25 per cent per share after a district has sold its quota.

(c) *Prizes.* Offer both weekly and contest prizes. Try to give as many small prizes as possible. Award your main prizes on "per cent of quota sold," especially your "individual championship" and "district championship." Then offer prizes for the most shares sold each week, for the largest single sale, for the most cash sales, for the most divided-payment sales—for anything you can think of. Be sure that, in addition to the prizes for men, there are plenty also for girls.

We have used both merchandise and cash prizes, with varying success. For the district or department championship we offered at first a loving cup, banner or some such trophy, but of late have offered a banquet at which we entertain every employee of the winning district.

Just before and during a contest it is desirable to run plenty of newspaper advertising, and on each advertisement it is well to have some such statement as: "Any company employee can take your order for this security."

If your papers will use it—and they generally will in the smaller cities—give them a story or two about customer ownership and the sale of company securities through employees. It is not desirable, however, to say anything about the "contest" plan or about "prizes."

THE PRELIMINARY MEETING

Before the sale contest starts it will be necessary to talk to all employees at a meeting or series of meetings. I have always had best success in putting the proposition before employees on the "ten-point" basis outlined in a previous article. If you can get every employee to call on ten people and if you can get them to tell these prospects ten points about your security, and if you send the people who are to be called on some good direct-by-mail matter, you will sell stock.

At the meeting of employees, require each one to turn in the names of ten prospects. Have a good mailing piece of some kind to send to all these prospects. This mailing piece should be a straight selling appeal. Don't just give a few generalities but get down to bedrock. Tell why the company is a good one to invest in and why the stock is a safe and satisfactory investment. Avoid "claims" and boasts and give facts and proofs. Be sure the story you tell follows through the natural stages of a sale: attracting attention, awakening interest, creating conviction, and arousing desire, and be sure it closes with some real reason for buying at once. You can afford to give much attention to this mailing piece because it will do most of the selling that is not accomplished by the newspaper advertising.

After the sale starts your work is largely a matter of meeting conditions as they arise. Be sure, when

necessary, to put pressure on the executives. Require them to make their employees make the "ten calls."

If you have one or more field managers, keep them on the jump, holding group meetings of employees, making sales, inspiring laggards, answering questions and stimulating enthusiasm.

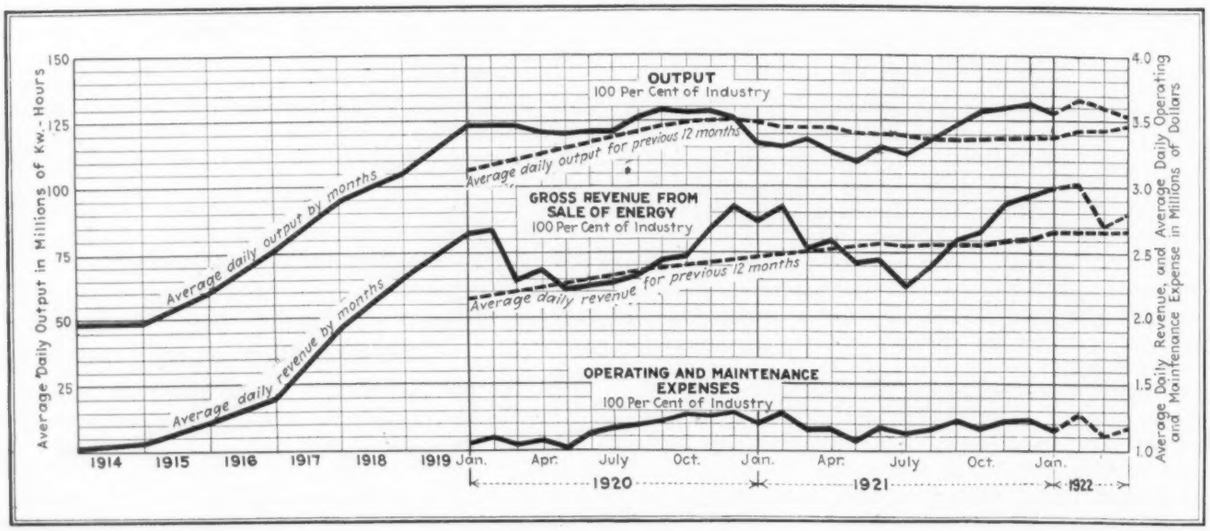
Get out a daily bulletin on a duplicating machine and mail it to all contestants. Give the standing of employees, prize winners, news of the sale and (in very moderate doses) inspirational matter.

If your company is large or scattered, much of the success of the sale will depend on the handling of correspondence in the home office. Employees in remote towns who make sales are not stimulated by the cold and stilted acknowledgments of the average treasurer's office—they want personal letters of thanks, congratulation and commendation. If they slow down, they need tactful prodding from the home office. The right kind of a letter writer in charge of all employee contest correspondence can make a lot of difference in final results.

If there be any who claim that these directions are rather incoherent, I can only say that "jazzing up" a fading employee security sale is an incoherent job. Handled with good common sense, by a man who will take advantage of opportunities as they arise, the jazzing-up plans are helpful. They can prolong greatly the productiveness of employee selling.

Ultimately, if my own experience is a fair criterion, there comes a time when employee selling cannot be depended upon for as much capital as a growing company needs. Then the management must turn to selling through regular security salesmen. How this can be done will be taken up in another article.

Output Decreased While Revenue Increased During April



REPORTS received by the *Electrical World* for the month of April from central generating and distributing companies representing 82 per cent of the installed rating of the country indicate that while the average daily output in the aggregate was considerably under that reported during March, yet the average daily gross revenue was slightly above that of March. Government reports indicate that only six primary manufacturing industries increased their activities above those of March and eight industries were operating below March, the leather industry as much as 8.2 per cent below. These curtailments in industrial power requirements account in large part for the decreased output during April. A most interesting fact, however, is that, despite this large drop in energy requirements, the gross revenue shows a slight gain over March. This would indicate that the drop in energy output was due largely to an extensive curtailment of the low-revenue or industrial power load, while the high-revenue or lighting load was on a par with or greater than that of March. The number of new lighting customers was undoubtedly largely increased during April throughout the country by reason of the large number of new houses being constructed and the spring campaigns of distributing companies to increase their domestic load. It is estimated that 1,231,000 domestic lighting customers will have been added to the central-station lines by the end of the present year, and it is probable that 75 per cent of this new load has been taken on during the first half of the year.

The Mountain and Pacific section was the only one which reported an output in excess of that during March. The irrigation load, which is a large factor throughout the West, was largely increased during April, and materially increased activities were reported in the metal-mining districts. These increased power requirements were apparently of such proportion as

TABLE I—CENTRAL STATION RETURNS FOR THREE MONTHS

	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1922 Thousands	1921 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1922 Thousands	1921 Thousands	Per Cent Increase		Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies reporting) 1922 Thousands of Dollars	1921 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1922	1921	Hydro Plants 1922	1921	Combined Systems of Steam and Hydro 1922	1921
Feb.	77	2,864,047	2,556,563	12.0	72	$61,388	$57,513	6.7	Feb.	54	19,110	19,522	−2.1	46.1	51.7	26.6	27.1	41.2	42.3
Mar.	78	3,157,133	2,781,799	13.4	72	60,857	55,990	8.7	Mar.	55	19,216	19,893	−3.4	48.3	54.6	27.1	21.0	40.7	42.8
Apr.	82	3,121,360	2,766,010	12.9	75	63,099	58,357	8.1	Apr.	61	21,533	21,660	−0.6	48.3	53.9	25.3	27.6	34.8	47.7

more than to counterbalance any decreased manufacturing or lighting load, if such a decrease existed in that section.

Owing to the continuation of the textile strike in New England, energy requirements of that primary industry were greatly reduced, but in the Southern cotton-mill districts plants were reported as operating at full capacity. The shoe industry was operating in about 80 per cent normal basis, with some plants operating full time. The curtailments in energy required by the textile industry plus decreased lighting requirements of the New England Section resulted in an average daily output in that section of about 600,000 kw.-hr. under that reported for March.

One of the most interesting phases of the central-station operations in the New England States is the fact that the operating and maintenance expenses have dropped materially during the past few months. In February the operating expenses of the steam electric generating plants in this section were 18.6 per cent above those of February, 1921. The operating expenses of these plants dropped materially during March and still more during April, when they were 2.1 per cent below those of April, 1921.

Increased activity was reported in many of the basic industries of the Middle Atlantic States, with a resulting increased call for electrical energy. In the South Atlantic States, besides the textile industry, the chemical plants in general reported a higher rate of operation. Taking the Atlantic Section as a whole, the industrial load of the central stations was probably slightly increased over March, but the decreased lighting load was such as to make the average daily output about 1,000,000 kw.-hr. under March.

The gains made during April by the iron and steel industry were very marked in the North Central States. The automobile industry also increased operations. Several other basic industries, however, decreased operations, which, in conjunction with the decreased lighting load due to the advancing season, resulted in an average output of electrical energy of almost 2,000,000 kw.-hr. below that reported for March.

Industrial activity in the South Central States was apparently almost on a par with that reported for March. The domestic lighting was, however, slightly decreased, and the power requirements of the section in the aggregate were about 300,000 kw.-hr. per day below those of March.

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A THREE-MONTH PERIOD

Month	New England States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	Atlantic States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	North Central States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	South Central States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	Pacific and Mountain States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase
KW.-HR. OUTPUT:																				
Feb.	82	232,008	184,854	25.6	81	1,076,312	961,362	11.9	68	866,304	780,706	11.0	60	148,267	138,023	7.4	93	541,156	503,307	7.5
Mar.	82	258,142	210,107	22.8	81	1,176,591	1,023,654	14.9	70	972,475	861,962	12.8	60	159,222	145,996	9.1	94	590,703	540,080	9.4
Apr.	81	231,884	205,089	13.0	82	1,127,732	972,146	16.0	80	1,026,525	909,447	12.9	63	156,175	143,801	8.6	94	579,044	535,527	8.1
REVENUE:																				
Feb.	82	6,771	6,165	9.8	75	23,811	22,008	8.2	55	16,953	16,091	5.4	60	4,372	4,243	3.0	93	9,481	8,920	6.3
Mar.	82	6,366	5,947	7.0	75	23,924	21,615	10.6	57	16,929	15,701	7.8	60	4,249	4,034	5.3	94	9,389	8,693	8.0
Apr.	81	6,136	5,809	5.6	76	23,952	21,839	9.7	67	19,594	17,981	9.0	62	4,132	3,976	3.9	94	9,276	8,752	6.0
OPERATING EXPENSES:																				
Feb.	52	1,944	1,639	18.6	55	7,023	7,259	−3.2	36	4,797	5,196	−7.2	59	1,992	2,173	−8.3	92	3,354	3,255	3.0
Mar.	53	1,800	1,741	3.3	56	7,135	7,345	−2.8	38	4,907	5,201	−5.7	59	2,088	2,312	−9.7	93	3,286	3,294	0.2
Apr.	53	1,621	1,655	−2.1	56	7,327	7,262	0.9	53	7,245	7,312	−0.9	61	2,092	2,075	0.3	93	3,248	3,356	−3.2

TABLE III—AGGREGATE OPERATING RATIO OF COMPANIES REPORTING DATA MONTHLY TO THE "ELECTRICAL WORLD"

Type of Generating Plant and Month	New England States 1922	1921	Average for Previous 12 Months 1922	1921	Atlantic States 1922	1921	Average for Previous 12 Months 1922	1921	North Central States 1922	1921	Average for Previous 12 Months 1922	1921	South Central States 1922	1921	Average for Previous 12 Months 1922	1921	Mountain and Pacific States 1922	1921	Average for Previous 12 Months 1922	1921
Steam Plants:																				
February	58.6	54.8	58.7	66.9	44.1	48.9	51.6	57.1	45.9	55.8	53.9	62.5	45.8	54.6	50.7	55.7	43.7	48.0	50.5	55.3
March	54.6	62.1	58.9	66.6	48.0	52.0	50.9	56.8	47.8	57.5	52.8	62.4	47.2	52.7	50.3	55.8	47.3	56.3	49.0	55.0
April	49.5	62.5	57.5	66.5	47.3	51.5	50.7	56.7	48.7	55.2	52.3	61.9	50.6	54.7	50.0	56.0	47.4	54.5	48.4	55.0
Hydro Plants:																				
February	29.7	32.8	30.0	47.9	17.2	20.8	17.8	20.8	26.7	23.8	22.4	21.4	37.4	37.7	35.2	33.8	37.8	36.5	26.7	24.2
March	36.3	34.1	31.3	45.0	23.9	27.8	18.2	22.4	26.0	25.0	22.7	21.8	37.0	37.3	35.0	34.2	28.6	36.1	27.0	25.5
April	38.4	37.0	33.1	44.1	21.0	24.5	18.5	22.8	23.6	24.3	22.6	22.1	37.2	22.4	36.0	34.2	27.5	31.7	26.9	26.4
Combined Systems of Steam and Hydro Plants:																				
February	45.3	46.5	53.2	53.3	46.5	50.0	43.6	48.4	44.7	46.6	46.4	55.8	38.6	43.0	43.7	45.7	34.6	34.7	37.7	41.5
March	46.7	46.0	52.8	52.7	49.3	52.4	44.5	49.0	43.3	49.3	46.7	55.8	41.6	38.4	43.8	45.4	32.6	34.1	37.2	40.8
April	43.7	45.9	52.6	52.4	47.7	50.6	45.1	49.7	47.8	52.7	46.9	55.8	39.8	43.7	43.5	45.1	33.7	38.2	36.8	41.0

A Lingering Prejudice that Must Be Cured

Plea for Recognition of Utility's Heritage from Former Times and a More Active Policy in Overcoming It—Winning the "Man on the Street"

BY H. S. COOPER
Dallas, Tex.

TIME WAS—and there is little use in these present days of denying these ancient facts—when most of the accusations and allegations of the politicians and demagogues against the utilities were largely true. There *were* "watered stocks" on which dishonest profits were desired. There *were* franchises obtained and used solely for the purpose of their financial exploitation. There *were* unreasonable and discriminatory rates and fares. There *was* a disposition to tell the customers and the general public to "mind its own business"—in the words of a popular poem of an earlier date, "All that we ask is to be let alone!"

It is as well for the utilities, when these facts are arrayed against them, to "acknowledge the corn." "Contrasts more clearly define differences" is an old and proved saying. Let the general—and generally hazy—objections of the present day be condensed into a few definite ones and these will generally be found to contain the accusations stated above, with, perhaps, a few explicit local ones. When so condensed all of these objections, accusations and criticisms answer and contradict themselves—the history of the utilities during and since the recent war, their control and regulation by public boards and commissions, their present attitude and condition of both finance and operating, are matters of public record easily available to every one, and thus the ancient accusations of reckless moneymaking and expenditure, contempt of the public and other crimes attributed to the utilities in times past can be conclusively shown not only to be non-existent but it can be proved that, under present conditions, it is actually impossible that they could exist.

THE PROVED FACTS OF THE CASE

Coming down to easily proved facts in detail: Commissions and courts in nearly all states have decided that a Niagara of water in the securities of any public utility company will have no effect whatever on the rates and fares and rules and regulations of that company so far as the consumer of its product or service are concerned. The only basis on which such rates and fares are formed and allowed is "the actual value of the property used or usable in the business."

Franchises also, it has been both judicially and legislatively decided, have nothing to do with the rates and fares except as they may specifically limit them.

Publicity as to the utility, in its every phase, is now not only the rule but it is the law universally. The property of the utility, its securities, its rates and fares, its methods and costs of operating, every small detail of the company from its charter to its last month's operations, are now public property, open not only to public officials and to the company's security holders but to its customers and to the public at large.

In every state of the Union the matter of discrimination in rates or fares is explicitly forbidden by legislation backed by judicial decision, and severe penalties are imposed for disobedience.

In regard to service the rules of the governing and controlling bodies are equally strict.

As to the rules and regulations issued by the utility for the use of its product or service, the laws of the various states are unanimous in prescribing that these must be "just, reasonable and not discriminatory."

Even the matter of extensions of service, and, in some cases, of increase or betterment of service, has been legally provided for.

In addition to all the above measures of public protection, there exists always the right of the individual, of groups, to appeal to their local, state or national courts for relief from what they may consider any illegal act on the part of the utility.

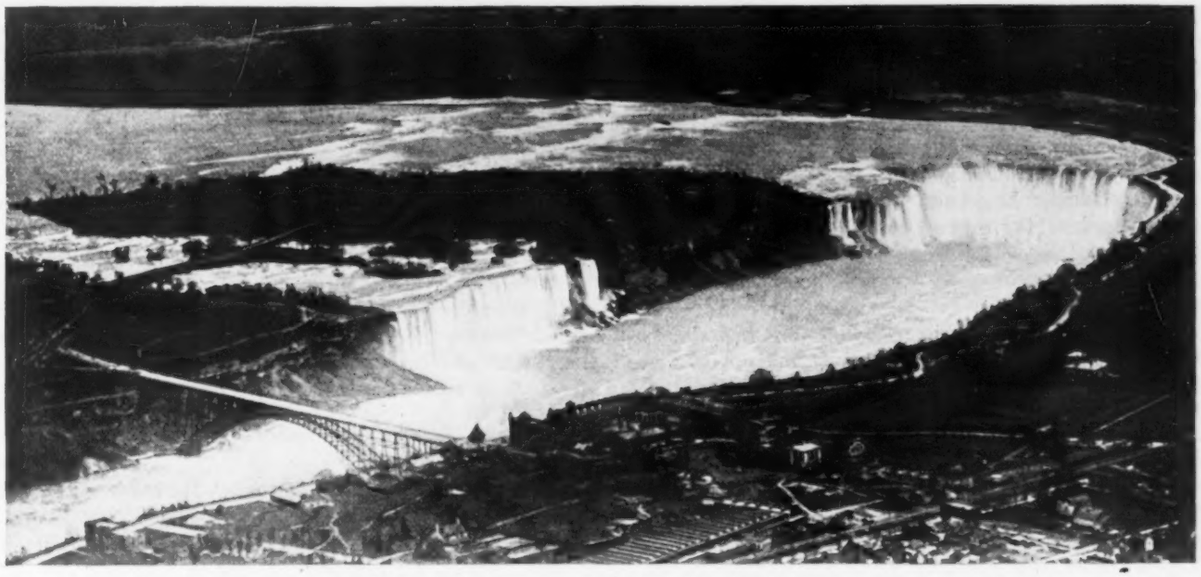
These facts are known—or should be known—to all the executives and administrators of every public utility in the land, but there have been numberless cases where it would seem that either they were not known or were not fully appreciated. It would also seem that there have been many cases where the dissemination of this information to the customers and the general public was not considered as the best publicity.

WHY THE STORY MUST BE TOLD

This is a vitally necessary item in favorable publicity for the utilities. The "man on the street," as Mr. Kennedy so aptly describes the average citizen and utility customer, reads but little of the published propaganda of the utilities or their friends the manufacturers and distributors. One reason for this is that a great deal of it is over his head. Another is that he considers all such publicity merely special pleas to cover or speciously excuse what he still mistily conceives as the shortcomings of the utilities.

It must be also remembered—and realized by the utilities—that that man on the street is not only a customer of one or more of his local utilities but that he is a customer from necessity and not from a desire for luxury. To keep up with his friends, to save himself and his family from unpleasant labor, to give himself and his family those things which custom and use have made the necessities of modern city, suburban and even country life, he feels compelled to use the product or service of his local utilities if they are in any way available. To him this product or service, its price and terms, its rules and regulations of purchase and use, the policy and practice, the operating methods and the standing of his local utilities are matters of personal and individual convenience, safety and comfort. His interest in the local utilities is purely a selfish and personal one. The failure of a utility he patronizes to make an adequate profit, its trials and tribulations are extraneous to his affairs, and he seldom considers that they affect him personally until he is personally and individually touched by increased rates or by a decreased or less satisfactory service enforced or threatened.

All this frame of mind is caused by the fact that this man on the street has not been made to *realize* what the utility truly is today—its place in the community and its relations to him personally. Most of the time the trouble with him is innocent ignorance of present-day utility conditions. In his mind still lingers the relics of conditions before the war. The cobwebs spun by designing politicians and self-serving demagogues still clog his clear perception and it needs the broom of plain, uncontrovertible facts, carefully and assiduously applied by a friendly hand, to clear away these cobwebs.



Niagara Falls Convention of A. I. E. E. Is Completely Successful

Attendance Doubles Expectation, the Quality of Technical Papers Is High and the Discussions Are Full and Animated—Queenston Plant a Center of Interest and Debate—Section Delegates Formulate Plans

A SPLENDID program was carried out at the annual convention of the American Institute of Electrical Engineers, held at the Clifton Hotel, Niagara Falls, Ontario, from Tuesday to Friday of this week. The attendance reached 650, exceeding expectations by 100 per cent. A free and full discussion of section activities was supplemented by technical papers of high merit.

The outstanding technical papers were those on the Baltimore tests of circuit breakers, where for the first time a generating system was utilized, in co-operation with manufacturing companies, under short-circuit conditions for testing oil breakers. Other interesting papers were devoted to technical discussions on cables and relays, and, to provide a diversity of interest, miscellaneous papers of high quality were presented.

A unique feature of the convention was the graded arrangement of the program. The more technical and specialized sessions were held in the early part of the week, thus allowing members unable to be present during the entire meeting to select the days on which the proceedings would hold most of interest for them.

Social features were provided for the ladies accompanying the delegates in the way of bridge parties, teas and scenic trips. Golf, tennis and baseball, combined with an inspection trip to the Queenston development of the Ontario Hydro-Electric Power Commission, very acceptably filled up the time of the men in the afternoons.

The president's address was deferred until Tuesday evening, when President McClellan addressed the members and guests at the president's reception. He spoke briefly on the topic "Why Does the A. I. E. E. Exist?" One of the best reasons, he said, was so that electrical engineers could have social gatherings like the one then under way. "But the Institute cannot exist just for pleasure," he continued. "There must be some big reason. I wish every younger member could know how the Institute had its beginning in intimate discussion and debate of problems directly confronting us then."

President McClellan went on to recount how first one field and then another broke off from the parent Institute, forming other societies; but he emphasized that these other bodies all have a business or commercial side, while the Institute still exists and grows stronger because it is the one place where electrical engineers, whatever may be their commercial connections, can keep the professional spirit of electrical engineering alive and untainted. It is a place where every electrical engineer may meet his brother electrical engineer on a professional basis. Now more than ever before, after the disturbing influences of the war, is the professional spirit needed, and all electrical engineers should get loyally back of the Institute. "What is this professional spirit?" Mr. McClellan asked. "It is integrity of purpose, honesty of effort; in short, it is typical of that which is at the bottom of our country's life. We must build even better in the future."

DELEGATES' SESSION NOTES

An innovation was made by the allotment of Monday to the activities of the section delegates. At previous conventions these delegates have held their meetings in the evening, but their importance in the Institute has

increased so rapidly that an entire day was needed for their activities.

Arthur W. Berresford, past-president of the Institute and chairman of the sections committee, presided at the meeting of the delegates. President McClellan greeted them by saying that such contacts were very important and that the meeting of the delegates furnished a clearing house of ideas for developing the status of engineering. President-elect Frank B. Jewett said that industry was just at the beginning of an era of tremendous development brought about by the war stimuli and the recent inventions in engineering.

The delegates acted on several questions brought before them by the committee. The meeting opposed the use of the grade "junior" and seemed to agree that membership should be of two classes only—first, those whose work and livelihood lie in electrical engineering, and, second, those who are interested in electrical engineering but not dependent upon it for their livelihood.

President McClellan suggested the use of the terms "junior," "member" and "associate," the "junior" members to be the younger electrical engineers who would be compelled to become members or associates after a certain period of time.

The meeting voted that no restrictions be placed on the expenditure of section funds. It also voted to allow sections to act on any local matter without the permission of the board of directors of the Institute, provided that the policy of the Institute was not involved.

A suggestion that divisional meetings be held based on the vice-presidential districts was voted down for the present, as was also a mandatory provision for a yearly meeting of divisional executive committees, the members to have their expenses paid by the Institute.

The delegates voted to have future meetings on the Monday of the week of the annual convention.

At the afternoon meeting of the delegates a long discussion was held with the meetings and papers committee, of which E. E. F. Creighton is chairman.

RADIO DRAWS ATTENDANCE

Radio was the most popular topic at A. I. E. E. section meetings during the past year, according to a report made by L. W. W. Morrow to the section delegates. The forty-one sections of the Institute held 293 meetings in the twelve months and a radio topic was on the program at thirty-eight. Other popular subjects, classed in order of frequency, were industrial applications, general non-technical topics, electrical apparatus, general scientific topics, and local power plants or power projects. Nearly every section obtained the best results by having only one subject and one speaker on the program, and of the many different means employed to obtain speakers personal appeals from friends brought the most response.

Twenty-five sections favored some action by the Institute by which they could obtain better speakers and could use their funds as best suited their local conditions. The conclusions drawn by Mr. Morrow were that the technical quality of the section papers, on the whole, is poor because the speakers are not notified soon enough to afford time to prepare better papers, because the present audiences prefer a general and elementary presentation and because high-grade speakers are difficult to secure. He said also that no co-ordinated plan or arrangement exists for making good programs, that no systematic effort is made to insure participation of members in the discussion, and that the social success of the meetings is handicapped by lack of funds.

Recommendation was made that a competent man should devote all his efforts toward co-ordinating and promoting section activities. He could serve as a clearing house for speakers and could give to the sections advice based on general experience as to ways of stimulating their members. In addition, officers of the Institute should visit sections more frequently and restrictions on the employment of section funds should be removed.

The opinion was expressed in the report that sections should devote themselves to educating and interesting their members rather than to the production of papers of a caliber suitable for Institute publication.

FOUR ANNUAL CONVENTIONS

Mr. Creighton gave a résumé of the activities of the meetings and programs committee. He announced that four conventions each year would be held in the future. He also outlined the changed character of the *Journal of the A. I. E. E.* and told of the attempt to get for inclusion with each paper a summary of its contents, a bibliography and a prearranged discussion. He pointed out that unsolved problems involved such items as how to handle discussions, how to improve the character of the papers and how to handle mathematical papers. He stated also that discussions would be presented with papers in the *Journal* by 1923 and that the committee was trying in every way to co-ordinate and systematize the work before it.

In the discussion that followed the consensus of opinion was that a section secretary was needed to co-ordinate and help the sections. The sense of the meeting was that some programs should be devoted to developing younger members and that others should include addresses by men of national reputation. President McClellan said that, independent of the numbers present at meetings, the younger men should discuss and argue questions in which they are intensely interested.

The meetings were attended by delegates from forty sections and by many other members of the Institute.

In an address of welcome to the convention on Tuesday morning A. Monroe Grier, president of the Canadian Niagara Power Company, pointed out that electricity has aided in cementing the friendship between Canada and the United States. He stated that much energy is still available at Niagara Falls and that a larger program for future developments is under way. President McClellan, responding, said that the members felt no sense of being in a foreign country, because of the similarity in problems, sentiments and history.

A. P. M. Fleming brought to the convention a greeting from the Institution of Electrical Engineers and other British engineering organizations. He asserted that all engineers share the responsibility of rehabilitating the world.

President-elect Jewett outlined a progressive policy for the Institute during the coming year, after which two parallel technical sessions were held. The first session was devoted to miscellaneous papers, some of which are abstracted in this issue of the *Electrical World*. Abstracts of the others will appear next week.

In discussing the paper on the two-stage current transformer, James R. Craighead, Schenectady, showed slides and gave data for a line of current transformers of the ordinary type which gave evidence that no

serious errors were introduced by ratio or phase-angle effects and that, inherently, errors were greater on 25-cycle than on 60-cycle designs.

The paper on dielectric tests on oils gave rise to much discussion which led to the general conclusion that variations in breakdown voltage were due to the inherent chemical properties of the oil. Dr. J. B. Whitehead, Baltimore, suggested using cylindrical conductors with corona breakdown for oil tests. Dr. Steinmetz told of several tests which tended to prove that the presence of air or moisture did not cause the variable breakdown limits. W. D. A. Peaslee, Huntington, W. Va., suggested filtering the oil between tests to study the effect of mobility of movement of the free electrons.

O. D. Wood, Pittsfield, Mass., maintained that the use of insulating barriers tended to prevent irregularity in breakdown limits, and F. W. Peek, Jr., Pittsfield, explained that, with barriers, the chances were removed that successive oil layers between electrodes would consist of oil of poor strength.

Prof. Vannevar Bush, Cambridge, Mass., pointed out that his paper described a new development of scientific interest whose commercial field was in the future. Dr. Steinmetz stated that the data introduced in the paper raised further doubt of the present theory of gaseous breakdown. Dr. Whitehead explained the action of the tube on the basis of a difference in mobility of positive and negative ions.

The paper on temperature measurements under service operation brought out a discussion in respect to the practice of others in making temperature measurements on service apparatus. In particular, probable sources of error in taking thermometer readings were pointed out.

The parallel session Tuesday morning was devoted to four papers on unrelated subjects. Some of these are abstracted in this issue and the others will be abstracted in next week's issue of the *Electrical World*.

In the discussion on automatic substations for direct-current railway distribution, moving pictures were used to great advantage to show in detail certain sequences of operation which were under discussion. D. W. Roper, Chicago, urged railways in their present position of financial ability to rehabilitate and catch up with the times—in contrast with the conditions prevailing in the past seven years—and to plan as many automatic substations, with the many resulting closely located feeding points, as possible, in order to reduce electrolysis as well as to increase economy.

W. E. Bryan, superintendent of power for the United Railways of St. Louis, again pointed out that variations in conditions make general conclusions difficult to determine and, more important, of doubtful value elsewhere. These same differences exist in different parts of the same city also. Comparing an annual distribution cost of $250,000, mentioned in the paper, for Cleveland, with $425,000 for St. Louis, Mr. Bryan argued that if 3,000-kw. substations are economical in the former case, the latter case would demand a larger number of smaller stations for best economy. By presenting considerable data as to cost, fixed charges, operating efficiency, etc., Mr. Bryan showed why he favors small automatic substations rather than larger ones.

M. J. Lowenberg, Boston, in discussing design for most economical layout and the use of Kelvin's law in that connection, pointed out that the permissible voltage drop is the controlling factor and should be determined at the outset. If first cost is the controlling factor (and a banker will usually say so when he is told that by using only 65 per cent as much copper the annual loss is only 10 per cent more), this voltage drop may be one-half—in the case of electric traction, of course, not lighting. In other words, one must "not use Kelvin's law to throw the burden on the stockholder." Another factor is the probability that standard practice or installation of standard cable sizes will frequently control the final design and upset the actual Kelvin law computation or modify it to a large extent as the governing factor.

SELLING SERVICE, NOT ENERGY

S. E. Doane, Cleveland, in discussing "Light Without Glare," points out once again that the electrical industry is selling light, heat and power and not merely electrical energy. The electrical industry has not completed its work, therefore, merely by connecting a customer and selling him energy; but there must be a selling of how to use the service, a study of "application from the customer's angle." There is a big gap, Mr. Doane declared, "between what little we know and what the public know." This must be bridged by demonstration, and demonstration of illumination is even more difficult and unusual than demonstration of vacuum cleaners, sewing machines, toaster stoves and other appliances. Prof. C. F. Scott, New Haven, said papers like Mr. Harrison's are a continuous revelation of how much is not known about light. While the whole electrical industry was at one time devoted to producing light, there was then no study of illumination. The work today he characterized as taking every-day commonplace things and putting them on a real and scientific basis.

Prof. V. Karapetoff, in discussing Bassett Jones' paper on how to install industrial motors, said that, in essence, the basis of Mr. Jones' paper was the use of the theory of probabilities in the application of motors to duty-cycle operation in large numbers. Recognizing the paper as a pioneer expression, welcoming intelligent application of mathematics to practical engineering, yet Professor Karapetoff warned against a probable influx of similar papers based on this one unless certain errors in the present paper were pointed out. He said that, after studying several hypothetical cases by Mr. Jones' theory and by the ordinary method of numerical averaging of currents as taken from the duty cycles, using ordinary judgment, he found that ocasionally Mr. Jones' method led to absurdities and at other times agreed exactly with results obtained in easier ways. For example, taking one problem quoted by Mr. Jones, in which the current obtained by the theory of probabilities was 300 amp., Professor Karapetoff showed that ordinary averaging of the currents under question also gave just 300 amp. Where such was the case higher mathematics was not needed to solve such problems.

QUEENSTON DEVELOPMENT

A very elaborate symposium on the new Chippawa-Queenston development of the Hydro-Electric Power Commission of Ontario was presented on Tuesday afternoon. The major engineering considerations involved in laying out and constructing the hydraulic as well as the electrical features* were covered quite extensively by F. A. Gaby, chief engineer of the commission, while

*The electrical features were discussed in the June 24, 1922, issue of the *Electrical World*.

features of the generators and transformers were described by representatives of the Canadian General Electric Company, Ltd., the Canadian Westinghouse Company, Ltd., and the Westinghouse Electric & Manufacturing Company.

Throughout the preliminary study of the Queenston development, and later as the design progressed, continuous use was made of models of the various structures in order that the mathematical analysis might be reinforced by actual demonstrations under the assumed conditions, Mr. Gaby pointed out in his paper. From the hydraulic point of view the provisions for overcoming ice difficulties and for regaining the kinetic energy of the water entering the forebay and the studies involved in determining the most economical proportions of the canal were most interesting.

Two forms of intakes are used at the mouth of the Welland River near Chippawa—one the conventional or surface intake, consisting of a concrete boom with fifteen openings fitted with drop gates, the other the submerged intake, consisting of six gathering tubes or draft distributors, which are 675 ft. long. Water enters the tubes along a distance of 500 ft. through a slot on their upstream sides.

A wedge-shaped structure was used in the entrance to the forebay to regain the kinetic energy of the entering water. By thus providing a 10-deg. angle of flare in the entrance it was possible to utilize the velocity of the entering water to increase the head at the penstock entrances.

To prevent shutdown from collapse of rock structures, each penstock was provided with a modified bell mouth having three openings sealed by a curtain wall extending down to within 28 ft. of the forebay floor. Behind this wall are steel-lined gate checks for structural-steel gates. The racks, which are removable in two sections, consist of bars set on edge and held in checks in the concrete screen-house walls.

The penstocks, which are incased in concrete, are designed to withstand the pressure due to static head, namely, 305 ft., plus the pressure rise caused by complete closing of turbine gates in one and one-half seconds.

Among the features of the turbines, aside from their rating, are the use of labyrinth seals on the runner runs to reduce leakage, the arrangement for removal of runners through draft tubes, and the provision of an emergency connection between the governor system and penstock to prevent shutdown due to pump failure.

Notwithstanding the very large rated capacity of the 45,000-kva. generators for the Queenston power house their essential construction features are not different from those of much smaller rated generators, said B. L. Barns and F. Bowness, authors of one of the papers regarding the General Electric generator. The generators are of the vertical-shaft type with two guide bearings and a thrust bearing. The thrust bearing is located above the stator and carries the weight of the complete rotating elements of the generator and water turbine. Each generator is provided with a direct-connected exciter.

The flywheel effect required for satisfactory speed regulation of the turbines necessitated the use of auxiliary flywheels mounted on the shaft adjacent to the generator rotor. The rotor is constructed with a number of cast-steel wheels which together form the rotor spider for carrying the pole pieces. The pole pieces are made of punchings and are attached to the rotor with three dovetails per pole. The coils are made of copper strip wound on edge.

The stator windings consist of form-wound, diamond-shaped coils, each slot containing two coil sides. The coils are made of stranded conductor and are insulated with mica tape, which affords more or less flexible insulation. The ends of the coils are braced against the distorting effect of severe short circuits in a manner that permits expansion and contraction.

Owing to the size of the generators certain interesting problems were encountered in the design of the Westinghouse generators, R. A. McCarty and H. U. Hart pointed out. The more important of these problems dealt with the design of (1) the armature winding, (2) the upper bearing bracket and (3) the rotating spider. The solution of these problems was briefly discussed, and a tabulation of major dimensions and weights of the generators was given.

FORCES LARGE IN TRANSFORMERS

Interest in the main step-up transformers centers largely about their great physical size and the heavy short-circuit currents to be dealt with. Physically they are the largest single-phase transformers in operation today. C. A. Price and M. E. Skinner of the Westinghouse company gave figures on the weights and dimensions of these transformers and their component parts as well as the performance calculated from test results. They also pointed out that the mechanical forces in 25-cycle transformers are inherently high because of the relatively large number of turns necessary to develop the voltage and because of their relatively low impedance to the flow of short-circuit currents. The nature and magnitude of the mechanical forces existing between current-carrying coils were discussed (1) for a single-turn coil in space, (2) for two single-turn coils arranged concentrically and lying in the same plane, (3) for two single-turn coils arranged coaxially and lying in parallel planes. The conclusion was reached that as long as primary and secondary coils are adjacent there is no limit on the shape of the coil from the mechanical point of view.

In his comment F. A. Gaby, chief engineer of the Ontario Hydro-Electric Power Commission, stated that five units were scheduled for operation by January, 1923, and that future units would have a rating of 80,000 hp. B. L. Barns, R. A. McCarty and M. E. Skinner described other interesting elements of the equipment, after which an animated discussion was held. B. A. Behrend, chairman of the electrical machinery committee, presided at the session and in opening the discussion briefly reviewed the developments at Niagara Falls. Messrs. Foster, Newbury, Behrend and Williamson then discussed the relative merits of solid and laminated rotor construction. Mr. Foster stated that the stresses at double speed should be less than one-half the elastic limit of the material and that conditions largely governed the type of construction to be used. Mr. Behrend stated that his experiences made him favor the built-up rotor type of construction.

F. D. Newbury, in discussing the papers, pointed out that the chief differences in the units made for the plant was that two methods of coil bracing were used and two types of insulation. One design used rings with the coils tied to the rings and the other used rigid brackets. One design used a flexible type of insulation in the straight part of the coil while the other used a rigid type.

Breakers Withstand Short-Circuit Tests

With Minor Modifications, All Types Ruptured Short Circuits Several Times in Succession Without Failure—Cscillogram Studies Made in Each Case—Ample Capacity Provided Back of Short Circuits

THE most extensive oil-circuit-breaker tests which have been conducted so far were the subject of three papers at the Niagara Falls convention of the American Institute of Electrical Engineers yesterday. The operators' viewpoint was expressed by H. C. Louis and A. F. Bang of the Consolidated Gas, Electric Light & Power Company and of the Pennsylvania Water & Power Company, Baltimore, respectively. These companies co-operated with the Westinghouse Electric & Manufacturing Company and the General Electric Company in the investigation. Observations of the manufacturers were presented by J. B. MacNeil of the Westinghouse Company and J. D. Hilliard of the General Electric Company.

Tests were made on the 13,200-volt, 25-cycle system of the Consolidated Gas, Electric Light & Power Company at the Canton substation, which is 7 miles from the Westport steam station of the company and 41 miles from the Holtwood hydroelectric plant of the Pennsylvania Water & Power Company. Generator, transmission line and cable capacities equal to or exceeding the normal operating conditions for the breakers were furnished.

CAPACITY OF SYSTEMS AND CURRENT OBTAINED

The rating in steam-driven turbo-generators was 127,500 kw., of which 87,500 kw. was usually available for tests. The hydraulic generating rating was 83,500, and there was also available on the system one 20,000-kw. steam-driven unit at the Pratt Street station in Baltimore. This brings the combined total generating capacity of the system up to 231,000 kw., and the maximum used in the test was 170,000 kw. The Canton substation is directly connected with the Westport steam station by four 26,000-volt submarine cables, banks of transformers being provided at either end, and is also tied to the city network by eight 13,200-volt cables through the Pennsylvania Water & Power Company, Highlandtown substation.

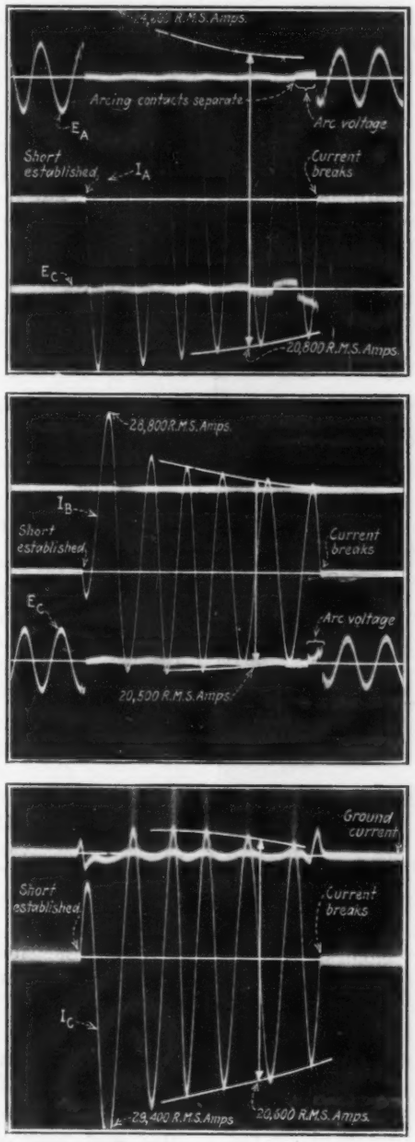


FIG. 1—PHASE VOLTAGES, PHASE CURRENTS AND GROUND CURRENT RECORDED DURING ALL TESTS

All short circuits were ruptured within three cycles to five and one-half cycles after establishment, depending on the character of the breaker, the actual period of contact separation or arcing being less than one cycle. In all except one case (Fig. 2) the current was interrupted at the zero point in the wave.

This group of oscillograms indicates the performance of an H-3 breaker on a three-phase short circuit reaching 29,400 r.m.s. amp. in one phase. As would be expected, when the "short" was established each phase voltage dropped to zero and was maintained there until the arcing contacts began to separate. From this point until actual current rupture, which was about one-half cycle, the phase voltage had a flat-topped arcing characteristic. During the "short" the ground current I_G had fundamental frequency.

As breakers of various capacities were tested, various values of short-circuit current were obtained by utilizing different numbers of generating units based upon short-circuit computations. It is remarkable to note that these computations give results within 5 to 15 per cent of the current actually obtained in the tests at the time of rupture.

All the tests were made at 13,200 volts, 25 cycles. Short circuits ranging from 950 to 30,800 initial root-mean-square amperes and from 750 to 23,700 ruptured root-mean-square amperes were obtained. The water-power station supplied about 30 per cent of the initial short-circuit current, 70 per cent being supplied either by Westport alone or by Westport and Pratt Street stations. The maximum instantaneous load on any of the generators did not exceed five times the normal load. Under the heavy short circuit, some cables carried from 2,000 amp. to 2,500 amp.

TEST ARRANGEMENTS FOR SAFETY

Most of the short circuits were made on three-phases to ground. A few were between two phases and ground, and several on one phase and ground only. After finding that two-phase and single-phase short circuits produced severe vibrations of turbo-generators, they were subsequently avoided. Since the Baltimore system has the neutral of all generators and transformers dead-grounded without any resistance, it was necessary for each individual phase of the oil circuit breaker to clear its own part of the short circuit without any help from the other phases. This might not have been required in an ungrounded or partly grounded system.

The general method of testing was to place the test breaker (set to open instantaneously) in series with two other oil circuit breakers, serving as protection in case of failure of the test breaker; they were set for delayed opening. A separate switch was used to act as a closing-in breaker exclusively. Hence, there were four breakers in all in the test circuit. Short circuits were established by throwing

dead metallic short circuits on the entire connected system. Three oscillographs containing three elements each were used, thus making a total of nine elements and three films. Each of them generally recorded the current in one phase and corresponding voltage to ground. A timing curve was obtained by recording the voltage of the other phase. The third film also recorded the ground current.

Potential transformers were connected from each phase to ground at a point between the two protective breakers, thus providing a measure of voltage across each phase of the test breaker, showing in succession full voltage before the short circuit, zero voltage and arcing voltage during the short circuit, and the re-established voltage after the short circuit was cleared.

For current measurement, the slip-over-type power transformers were used by one manufacturer and were put in the line between the two protective breakers. The other manufacturer used shunts to measure the

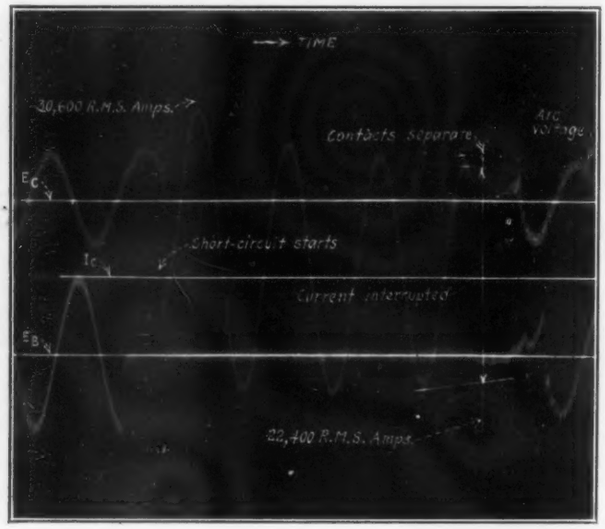


FIG. 2—IN THIS TEST THE CURRENT WAS NOT INTERRUPTED AT ZERO POINT OF WAVE

current. These were arranged in the form of an equilateral triangle and put in the leads at the short-circuited and grounded end of the test breakers.

A study of the oscillograms indicated that the voltage of the short-circuited phase becomes zero the moment the short circuit occurs, but later reappears as a typical arcing voltage with the well-known flat arc characteristic corresponding to the arcing contacts separation. After a little more than one-half cycle of arcing, the current is ruptured, and practically normal phase voltage is established. The greater percentage of short circuits were broken at the zero point of the current wave, corresponding to the time at which the magnetically stored energy of the system is the minimum, but occasional exceptions are found to this rule.

In order to determine the root-mean-square value of current at any moment, the method described by Hewlett, Mahoney and Burnham before the A. I. E. E. in 1918 was used. This method combines at any moment the effective alternating-current component and the direct-current component by the square root of the sum of the squares. To determine the true root-mean-square value which the breaker interrupted, the component parts are taken from the films at the moment that the arc voltage first appears, that is, at the instant the arcing tips part. However, in most cases, the direct-current component of the current wave was usually negligible at this time. To determine the maximum root-mean-square obtained on the short circuit, the component parts were taken at the peak of either of the first two half waves, depending on which was the larger.

About 200 short circuits were placed directly on the Baltimore system at Canton many of which involved the largest short circuit obtainable at this place. Not a single breakdown of the equipment of the two operating companies occurred. Furthermore, only two serious disturbances resulted on the system, one being due to the opening of a disconnecting switch in the station and the other being caused by the burning open of one of the leads in the station at its terminal. The most sensitive equipment on the system seemed to be the rectifiers used for street lighting, which frequently would drop out. The reason that no serious disturbance occurred seemed to be that the time element was too short, the short circuit being permitted to continue only about one-quarter second and never more than one-half second. Besides, the short circuits were not made directly at the generating station, so there would always be some voltage left on the generators to maintain synchronism, and the system is equipped with a carefully designed and adjusted selective relay system.

CONCLUDES 20,000 AMP. CAN BE RUPTURED IN LESS THAN ONE CYCLE

The largest breaker tested by the Westinghouse company was the type "O-3." This breaker was subjected to eight short circuits varying from 16,000 r.m.s. amp. to 24,000 r.m.s. amp. The last seven short circuits were made in succession without inspection of the breaker and the time element between short circuits varied from one and one-half minutes up to thirty-five.

The arcing tip of this breaker opened three cycles after the short circuit was placed on the system, and the arc in all cases was completely ruptured within four cycles from the time the short circuit was placed on the system, the average being three and one-half cycles (0.14 second). The average time of arcing was one-half cycle (0.02 second), with a maximum of one cycle (0.04 second).

A modification of the type "CO-2" breaker was tested seven times in succession without inspection or alteration, with ruptured currents varying from 18,000 r.m.s. amp. to 22,000 r.m.s. amp. The arcing tip opened approximately three and three-quarters cycles (0.15 second) after the short circuit was thrown on and the circuit was completely ruptured, on the average, four and one-quarter cycles (0.17 second) from the time of short circuit. The time of arcing averaged one-half cycle (0.02 second).

A modification of the type "O-1" breaker was tested under short-circuit conditions twelve times in succession, the first five of these tests being made in a period of eighteen minutes and the last four in a period of four minutes. The others were made at varying intervals. The current rupture ranged from 19,000 r.m.s. amp. to 23,900 r.m.s. amp. The arcing tip parted, on an average, approximately three cycles (0.12 second) from the time of short circuit, and the circuit was completely ruptured, on an average, three and six-tenths cycles (0.144 second) from time of short circuit, making an average time of arcing of approximately six-tenths of a cycle (0.024 second).

A series of nine short circuits was placed on the type "OE-6" breaker, of which five were made in a period of eighteen minutes and the others at varying intervals. The current actually opened ranged from 16,300 amp. to 21,000 amp. The average time from the point of short circuit until the arcing tips parted was about three and one-quarter cycles (0.13 second), until the circuit was completely ruptured three and three-quarters cycles (0.15 second), and the period of arcing averaged one-half cycle (0.02 second). The oil was extremely black and muddy at the end of the tests. A modified type "E-6" breaker was subjected to a final test of ten short circuits, on which the current ruptured varied from 10,000 amp. to 11,800 amp. The average time from the moment of short circuit until the arcing tips opened was approximately three cycles (0.12 second). The average time until the circuit was completely ruptured was three and three-quarters cycles (0.15 second), and the average time of arcing was three-quarters of a cycle (0.03 seconds). The last five short circuits were made in a period of four minutes, or an average of less than one minute between short circuits. Approximately one-half gallon (1.8 liters) of oil was thrown from each tank through the oil separators on the ten short-circuit tests.

It seems probable that the rupturing capacity of a given breaker on 60 cycles is more than it would be on 25 cycles. The data show that on 25-cycle circuits with heavy current of the order of 15,000 amp. to 20,000 amp. the arc can be expected to go out in less than one cycle after the arcing tips part. On 60 cycles the energy liberated in the tanks per half-cycle is only two-fifths as much as on 25 cycles, and the opportunity for putting out the arc occurs more frequently on 60 cycles. Most of the breakers used in these tests were modified slightly as experience under test conditions proved valuable.

LIFE OF BREAKER—A FUNCTION OF COPPER IN ARCING TIPS

Referring to the tests on General Electric Company apparatus, Mr. Hilliard points out that the tests do not apply universally to all 13,200-volt, 25-cycle systems and circuit connections, and are conclusive only for the modified breakers employed on the particular system involved and under the specific conditions existing during the investigation. The tests were to determine the suitability of the breakers to handle five successive short circuits with all the power which the operating companies could deliver and were not begun until after the changes indicated as a result of preliminary tests had been made. The remodeled breakers consisted of the following types: FH-3Y, FH-6Y, FH-9Y and a single pole of an experimental type, FHD-17Y, the so-called dead-potential FH breaker.

The remodeled type FHY breakers differed from the standard type FH breakers in having heavier tops, contact rods, bolts and bolting members, also heavier internal baffle construction, and an external separating chamber of insulating material, leading from the top of each oil tank through which the gas is ejected and in which chamber any atomized oil vapor is retained by the condensing material contained in the tube, and returned to the oil tank.

The type FH-3Y breaker interrupted an average current of 20,600 r.m.s. amp. once without oil throw and an average current of 20,200 the second time without oil throw. At this second shot a defective lever arm on the mechanism broke and the breaker was not tested further. The type FH-6Y breaker interrupted five successive short circuits averaging 20,200 r.m.s. arc amperes. A few drops of oil was the extent of the oil throw in any of the tests. The type FH-9Y breaker interrupted five successive short circuits with an average current of 19,160 r.m.s. arc amperes. The oil throw was limited to a few drops except from a leaky gasket on one phase. The single-pole element of the type FHD-17Y breaker interrupted five successive short circuits averaging 17,670 r.m.s. arc amperes. During this period the oil throw was very small.

The burning of the contacts and contact rods for the five short circuits was small on all of the breakers tested and was substantially the same for all breakers—about $\frac{1}{4}$ in. (6.3 mm.) was burned from the end of each contact rod.

The results of the tests indicate unquestionably

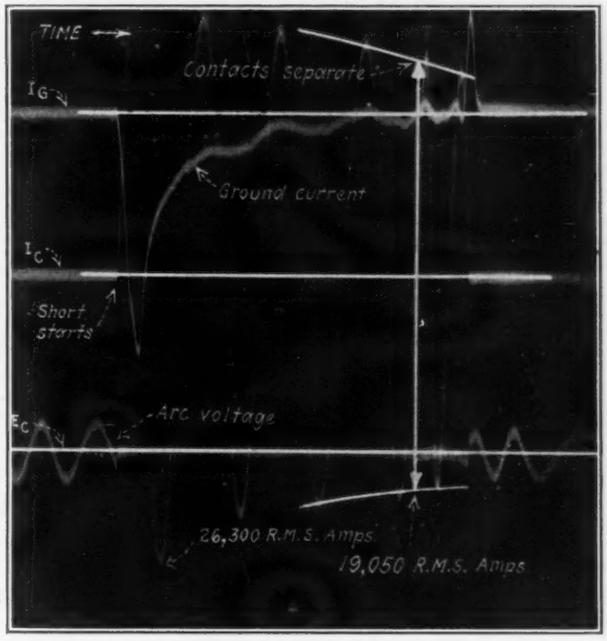


FIG. 3—A PECULIAR GROUND CURRENT I_G OCCURRED IN THIS TEST

that it is possible, with proper design, to build oil circuit breakers which can be relied upon to interrupt large current on high capacity systems satisfactorily many times in succession without damage to the breakers, without throwing any oil and without change of oil or adjustment. Minor improvements in design will tend toward a decrease in the energy loss in the tanks, with improved control of gases, relief of pressure produced in the tanks and the entire elimination of oil throwing. It was observed that the life of the breaker and the number of times it can successfully and repeatedly open the circuit is a function of the amount of copper in the arcing tips. The condition of the oil in the breaker is not such a very important matter.

The investigation proves that it is possible to conduct a series of tests directly on a modern system without damage to the equipment and without serious interference with its normal operation. This fact should encourage other companies to co-operate with manufacturers in the improvement in oil breakers of other designs and ratings.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Measuring Direct Current with Split-Core Transformer

To the Editors of the Electrical World:

In the April 15, 1922, issue of the *Electrical World* I note in the section entitled "Scientific Industrial Research" an article on the "Measurement of Large Direct Currents." The method described apparently is the same as I have developed in our testing laboratory.

I have used both a closed circular magnetic circuit and a split-core transformer for the measurement of direct current. If the alternating-current supply voltage is held constant, the magnetizing component of the alternating current is proportional to the direct-current ampere-turns.

If the magnetizing current is plotted as the ordinate and direct current as the abscissa (assuming one-turn conductor), the curve obtained has the same characteristic shape as the *B-H* curve of the material used as the core of the transformer. If a split core is used, interposing an air gap, the direct current, of course, reaches a higher value before the knee of the curve is reached.

One of the disadvantages of this method is that any variation in the alternating-current supply brings in an error in the measurements, but I find the loss in the transformer (I^2R and core loss) to be very nearly constant over a wide range of direct current.

G. L. HILL,
Assistant Engineer
Bureau of Tests and Inspections.
Pacific Gas & Electric Co.,
San Francisco.

Selectivity Between Stations More Important than Selectivity for Distance

To the Editors of the Electrical World:

In my opinion, the radio receiving sets which are being made by several of the manufacturers at this time will not give the best results to the users in or near large communities. This is probably due to the fact that a set with a large number of adjustments, each of which has to be just right for a signal to be received, would not perhaps be as popular as some of the present very simple sets. The sets referred to are very selective as applied to distant stations. They can be adjusted to receive from one station, and they will very satisfactorily cut out other distant stations operating on wave lengths differing only very slightly from the wave length to which the set is tuned. However, these sets are not selective as applied to heavy interference caused by sending stations of medium size near the receiver or by signals from sending stations of large size at relatively short distances from the receiver. To put the matter briefly, the sets are selective as between distant stations, but are not selective when there is a station near which can cause even reasonably heavy interference.

In my opinion, it will be necessary for the receiving sets to be able to tune out any reasonable interference if they are to serve their purpose in the future. There are a very large number of amateur and commercial stations in and around New York City, for instance, and the receiving set should be capable of tuning out to a large extent at least the local stations and be able to pick up signals from distant stations. Receiving sets have been designed which are very effective in this regard, although it is true that they have more adjustments and require more skill in their use than the sets which are now being sold by some large companies in very large volume.

In my opinion, the set which is selective between stations without regard to distance within reasonable limits is very much preferable to the set which is selective only with reference to distant or weak stations. While a few days might be required to get familiar with the more complicated adjustments, this should not detract from the sale of the sets, because any one using the set for a few days would soon learn that a certain setting on each of the dials and switches would bring in a given station, and after the setting was once found it would not be necessary to have to hunt for the station, as the dials would be set as had been found satisfactory before and the station would be received.

Sets of the kind recommended have been made which are at least equal to any of the sets now on the market as regards loudness of signal, and which very much exceed the majority of the receiving sets now sold in regard to selectivity under all conditions.

E. P. PECK,
General Superintendent Electrical Department.
Utica Gas & Electric Company, Utica, N. Y.

Energy Front of Electric Circuits

To the Editors of the Electrical World:

The object of discussion being an impersonal one and rather for the benefit of the common weal, may I be permitted to express an opinion that non-mathematical generalities bear a Faraday relationship to electrical science, whereas what is wanted is the Maxwellian or mathematical one? Otherwise how can one satisfy the particular Kelvin dictum "to understand is to calculate"?

Unfortunately there is considerable disagreement between the mathematical conclusions—at least as much as between the non-ether concept of Einstein's followers and the decidedly ethereal one of Maxwell, Heaviside and Hertz! It is difficult to reconcile the Steinmetzian view as expressed in the February number of the *Journal of the A.I.E.E.*

Then, again, with regard to bending wave fronts being due to resistance of an electrical circuit, it should be stated that in the case of open-ended coils Fleming showed and the writer proved mathematically (see *Electrician*, June 7, 1918) that the speed along a *pure inductance* could be but one one-hundred-and-fiftieth of that of light. Moreover, it is not clear what the surge impedance has to do with sustained oscillations on wires or aërials.

What, perhaps, is the most important difficulty is how, with the physical-mathematical methods ordinarily employed, to account for the substantially cylindrical wave front encircling an open-ended aërial for sustained oscillations. A constant current-phase constant-current amplitude along the aërial will not account for it. Even MacDonald on "Electric Waves" would agree to that. It should be remembered that in radio the sink *S* is not conductively connected to the source *G*.

A. PRESS.
Washington, D. C.

Industrial and Station Practice

Installation, Operation, Test and Repair of
Generating and Distribution Equipment and Methods of Economically Utilizing
Electrical Energy in Mills and Factories

Requisition Form Hastens Station Construction

TO FACILITATE work in the design and construction of substations, the Southern California Edison Company has devised a form headed "Request for Substation Design," which is now being used by the operating department of that company when making requests upon the engineering department for substations needed in the immediate future. This request really amounts to a requisition for a substation. The growth of the system and the need for building many substations at once, with the consequent necessity of speed both in design and in construction, are the primary factors that make such a form advantageous.

When it is seen that a new substation will soon be needed in a certain territory, the operating and the distribution departments get together to find out what equipment will be necessary at this particular location. When they have agreed upon their needs, the request is submitted by the superintendent of station maintenance and approved by the manager of operation. It is then submitted to the protection engineer for any advice regarding protective equipment such as relays and lightning arresters, after which it is finally submitted to the chief electrical engineer for corrections or approval. The request is then sent to the engineering department so that it may start on the design, and a copy of the request goes to the construction department, which can proceed to place orders with the manufacturers for machinery that will take some time to build. The construction department can also estimate how many men will be needed when the actual work of construction begins.

Studying the form, it is seen that the requirements necessary in the construction of the station are listed and that the form is made up so that the request for the station can be prepared with a minimum amount of work on the part of the operating department. Provision is made for entering the location, date of completion, character of the building, incoming and outgoing lines, capacity of transformers and rotating machinery, as well as other equipment needed. On the back of this form room is provided for a single-line diagram of the station and for a sketch showing its geographic location. These sketches are prepared by the operating department when the engineering department is asked to prepare the design and estimates.

It is not intended that this form shall cover all the minor details which may develop, and it is expected that these questions will be brought up from time to time as the detailed design and the construction progress, but the form places the requirements of the station on a definite basis and assists greatly in having the new substation in operation on schedule time.

It is interesting to note that the Southern California Edison Company found it necessary in the last few months to place a request with its engineering department for the construction of thirteen of these substations. The growth of the company's system necessitates that the majority of these stations be built simultaneously; consequently such a system as that outlined above will prove of considerable value.

SOUTHERN CALIFORNIA EDISON COMPANY

REQUEST FOR SUB-STATION DESIGN

Engineering Dept.:

Design Sub-station to provide facilities as detailed below.

Location Saticoy Name Saticoy Sub-station

Required date of completion March 1, 1922 19

Station covered by Edison 80 No. Item Budget 19 22

		Number	Capacity	Voltage
Incoming Lines	1 - 60 K.V. from San Fernando	2	4/0 Al.	60 Kv
	1 - 60 K.V. from Castaic.			
Outgoing Lines	2 - 60 K.V. to Santa Barbara	2	4/0 Al.	60 Kv.
	4 - 15 K.V. Feeders	4	2/0 Cu.	15 Kv.
	5 - 4 K.V. Feeders	5	2/0 Cu.	4.0 Kv.
Voltage Regulators	1 - Regulator on 4 K.V. bus.	1	200 Amp.	4.0 Kv.
Street Lighting Regulators	None			
Condenser	As indicated	1	2000 Kva	440 V.
Transformers	Outdoor Type	Indicate Cooling by (X)		
	Cooling as indicated	Air / Oil / Water		
		X	3	750	60-15 Kv
		X	3	1500	60-15 Kv
		X	3	500	15-2.2KV

Answer "Yes" or "No" to the following questions by placing (x) in proper column.

		Yes	No			Yes	No
1	Has Sub-station site been purchased	X		26	City Water available	X	
2	R/W for incoming lines obtained	X		27	Well and Pump required		X
3	R/W for outgoing lines obtained	X		28	Sewer	X	
4	Transformers outdoors 8250 KVA	X		29	Septic Tank		X
5	Oil Switches outdoors 60 KV	X		30	Lot to be fenced	X	
6	Lightning Arresters incoming 60 KV Lines	X		31	Grading and Lawn	X	
7	Lightning Arresters outgoing 15 and 4.0 Kv	X		32	Sprinkling System for Lawn	X	
8	Cooling Tower	X		33	Telephone—Edison Hi-line	X	
9	Sub-station Bldg. Brick	X		34	Telephone—Commercial	X	
10	" " " Concrete		X	35	Special Lighting Transformer	X	
11	" " " Galv. Iron		X	36	Special Power Transformer	X	
12	" " " Lath and Plaster		X	37	Ground Detectors 4 and 15 KV Lines	X	
13	" " " Frame		X	38	Single Bus Kv KV		X
14	Provide in Sub-station for Office	X		39	Double Bus 60 - 15 Kv and 4 KV	X	
15	" " " " Store		X	40	Underground Lines KV		X
16	" " " " Battery		X	41	Transformers on hand 60 KV	X	
17	" " " " Lavatory	X		42	If so, explain in General Remarks		
18	Auxiliary Buildings—Store Room	X		43	Emergency battery lighting	X	
19	" " —Garage	X		44	CR relays on Castaic & San Fernando 60 Kv	X	
20	" " —Cottage	X		45	Spare position for 15 Kv. lines	X	
21	" " —Pump House	X		46	OC relays on S. Barbara 60 Kv	X	
22	" " —Oil Storage		X	47	Spare position for 4 kv lines	X	
23	" " —Office		X	48	OC relays on Transformer Protection	X	
24	Meters regular	X		49	OC relays on 15 Kv lines	X	
25	Meters Special Meter 2 districts		X	50	OC relays on 4 Kv. lines	X	

INSTRUCTIONS

1. Make 3 copies, 1 to Engineering Dept., 1 to Construction Dept. and file copy.
2. Make 1 sketches on back of this sheet, (a) Single Line Diagram of Station wiring showing incoming and outgoing lines, buses, switches, transformers, and arresters.
(b) Rough sketch of station property showing dimensions of lot, names of bounding streets and approximate location of buildings and apparatus.

Submitted by H. L. Sampson

Approved by H. F. Pearson Manager of Operation

REQUISITION FORM THAT FILLS ALL NEEDS OF EQUIPMENT LAYOUT

It is interesting to note that the Southern California Edison Company found it necessary in the last few months to place a request with its engineering department for the construction of thirteen of these substations. The growth of the company's system necessitates that the majority of these stations be built simultaneously; consequently such a system as that outlined above will prove of considerable value.

E. R. STAUFFACHER,
Protection Engineer.
Southern California Edison Company,
Los Angeles, Cal.

Telephone Placed on High-Tension Power Line

A TELEPHONE circuit carried on the same cross-arms as a 110,000-volt transmission line of the Georgia Railway & Power Company has been giving satisfactory service for nearly a year. This 110,000-volt line was completed and put into operation during the month of September, 1921, and connects this company's system with that of the Alabama Power Company. The junction point of the two companies is at the Georgia-Alabama state line, about 17 miles from the Lindale station, a large substation of the Georgia company. This station also serves as the connecting link with the Tennessee Power Company. The interconnection was effected by tying in the Gadsden station of the Alabama Power Company with the Lindale station of the Georgia Railway & Power Company.

The line from the Gadsden station to the Georgia-Alabama state line is an H-frame construction on 50-ft. cresoted poles with No. 3/0 A.C.S.R. aluminum cable. The telephone circuit is carried on separate poles off the right-of-way with No. 12 copper for the conductor. From Lindale to the Georgia-Alabama state line the construction is also on H frames, using 50-ft. Western Red Cedar poles and a No. 4/0 A.C.S.R. aluminum cable for conductor. The telephone circuit in this case is carried directly on the power cross-arms, as shown in Fig. 1, and $\frac{7}{16}$-in. extra-hard-drawn galvanized guy strand is used for the conductor.

Considerable doubt existed as to the conditions that would be encountered in the telephone circuit on the seventeen miles of line in Georgia, for with an exposure of from 5 ft. to 9 ft. from the power conductors it was predicted by some that the telephone line would not function at all. The telephone line is insulated for more than 22,000 volts, for the pin-type insulators used have a working rate of 27,000 volts. The dead-ends are insulated with two of the ordinary 10-in. disks. Transpositions are made on every third pole, which corresponds to a distance of from 1,500 ft. to 2,500 ft., depending on span lengths. At the Lindale station a 15-kva., 2,300-volt transformer was installed and a 25-kva., 2,300-volt transformer was placed at the state line. The 25-kva. unit is shown in Fig. 2. Both of these transformers are used for drainage coils—that is, the high-tension windings are connected across the telephone line with the middle point grounded. The low side is open.

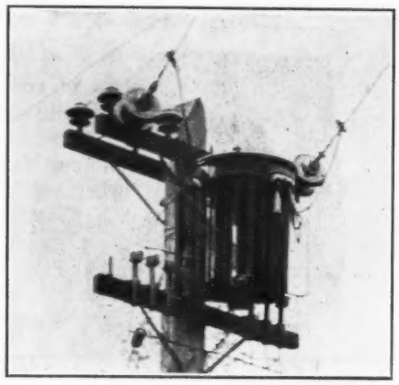


FIG. 2—STANDARD 25-KVA. TRANSFORMER USED AS DRAINAGE COIL

Voltage readings to ground were taken at the state line with drainage coil in at Lindale, and a reading of from 25 volts to 50 volts was obtained. The drainage coil at the state line was then added to the circuit, and the voltage was such that no reading could be obtained. A reading of 6 volts to ground was observed on the line in Alabama. The two telephone systems of the company were then put together, and since then very satisfactory service has resulted. The distance from Lindale to Gadsden is approximately 52 miles. Regular conversation is carried on over this telephone line from Atlanta, Ga., to Birmingham, Ala., a distance of more than 150 miles.

P. C. HERAULT,
Superintendent Transmission.
Georgia Railway & Power Company,
Savannah, Ga.

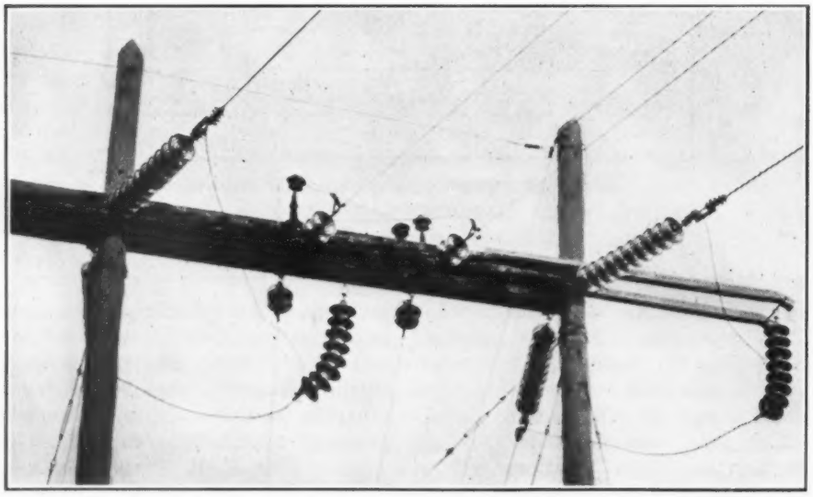


FIG. 1—BY USING DRAINAGE COILS AND FREQUENT TRANSPOSITIONS TELEPHONE OPERATES SUCCESSFULLY ON 110,000-VOLT CROSS-ARMS

Inspection of Hydro-Electric Plants

HYDRO-ELECTRIC plants of long standing tend to get into a condition needing attention from the standpoint of safety. Very often an engineer who is not in daily contact with a plant can easily find imperfections and faults which escape the regular attendant. As a guide to others in checking bad conditions a few examples of defects noted in practice in small hydro-electric stations are presented here. Taken in group, they illustrate the importance of paying constant attention to the so-called "minor features" of apparatus service.

Danger of penstock collapse from sealed vents was threatened in one plant. These vents may in some cases become sealed by ice or other matter, and should an attempt be made to drain the penstock by closing the headgates and opening the turbine gates a collapse would easily be possible. Surge tanks may obviate this danger, but it is good practice to see to it that penstock vents are kept constantly open and protected when necessary by wooden traps. In connection with penstock installation where surge tanks are installed near the generating plant, window breakage has sometimes been experienced because of ice discharges from the tanks. One case of this kind resulted in the bombardment of an exciter generator inside the plant by falling ice. Strong screening of windows is prescribed in such locations.

Protection of station and substation wiring is very important in water-power plants on account of the possible dampness present and

also because of the diversity of jobs required of operating forces. Adequate spacing between phase wires and between live conductors and adjacent apparatus and metal structures is worth working hard to accomplish.

BAD INSULATION ON GENERATOR LEADS SOURCE OF TROUBLE

In one plant inspected the generator leads were improperly protected where they entered the conduit at the machine base. Lightning trouble previously caused the insulation to burst on similar legs of the circuits from all generator switches to the 10,000-volt bus, yet these wires were not taped up and put in safe operating condition after the trouble occurred. The fused switches used were weak mechanically, besides threatening grounding on the penstock when fuses were being removed.

Secondary conductors from potential transformers were run too near the 10,000-volt wiring over the switch cells; the grounds on the arrester connections were indirect, with too many bends, and in one place the conduit for control wiring was not continuous. Control wires for bell alarms and switches in a local transformer and switch-house layout were carried across the tailrace in pipe conduit liable to injury from ice discharging from the surge tank of one of the penstocks. It was recommended by the inspecting engineer that these pipes be carried on a bridge or other rigid support and protected against possible damage.

In one plant the remote-controlled electrically operated switches took their energizing current from the exciter bus. When the station generating apparatus is all shut down, as is sometimes the case, since the station is tied into a high-tension network, the operator is obliged to go to the switch and operate it manually. Any delay in operating the switches in case of trouble may prove disastrous in such cases. It was recommended that a storage battery be installed to care for this situation.

The absence of a protective bell alarm system on some of the outgoing lines was another lack, and failure of the operating company to equip all incoming telephone lines with insulating transformers was also noted. Owing to the lack of means of heating the switch room in one plant visited, the oil in the switches at times became congealed in extremely cold weather. Some method of inclosing the tanks with asbestos board or other suitable material and the installation of electric heating coils, it was pointed out by the inspector, would obviate this objectionable feature. Another undesirable practice discussed was the mounting of an ordinary pin-type insulator in an inverted position to carry the high-tension transformer-bus cable. This tends to allow dirt and moisture to collect in the petticoats and thus reduce their insulating value considerably.

Horn gaps mechanically weak were found elsewhere. These were easily blown apart by the wind with resulting danger during storms. Proper lighting of arresters was also lacking.

E. S. LINCOLN.

E. S. Lincoln, Inc.,
Portland, Me.

Pulverized Fuel Plant with High Efficiency

UNUSUALLY interesting information became available during the past year regarding the possible high operating efficiencies obtainable by the use of pulverized coal in large power plants. The new Lakeside plant of the Milwaukee Electric Railway & Light Company is now in full operation and some very interesting tests have been made there, according to the prime movers' committee report presented at the recent N. E. L. A. Convention at Atlantic City. The results of two tests are shown in the accompanying table. As shown in the first column, when the boiler being tested was brought up to a rating of 157.4 per cent the efficiency of the boiler, furance, superheater and economizer based on coal as received was 89.3 per cent. When the capacity developed was 204.2 per cent the efficiency was 89.001 per cent.

The Lakeside plant operated throughout the entire year without interruption and is regarded by the operating forces as a much more desirable type of boiler plant for efficient operation than the stoker plants hitherto accepted.

The experience of the past year seems to show that when a powdered-fuel plant designed along the best lines is compared with a stoker plant similarly designed the cost of maintenance and operation is found to be the same, while the efficiency obtained is 5 per cent in favor of the more modern method of fuel combustion. Engineers interested in pulverized fuel plants can make their own deductions from these figures.

Last year all the boilers in the Lakeside plant were equipped with the Lopulco system of feeders, burners and furnaces, and they are now in satisfactory operation, showing an efficiency during steaming periods of 85 per cent for the combined furnace, boiler, superheater and economizer.

The possibilities offered by pulverized coal—continuously high thermal efficiency, flexibility of furnace control, almost complete elimination of banking loss, and utilization of otherwise waste fuels—all of which have had ample practical demonstration, must now be seriously considered in the design of any steam plant of importance. In fact, a number of such plants constructed within a year past, although initially making use of the mechanical stoker, have been designed with a view to the possible ultimate adoption of pulverized coal.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

OBSERVATIONS MADE FROM TESTS AT LAKESIDE PLANT OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY

Test of Edgemoor boiler No. 1 to determine efficiency of boiler, furnace and superheater, using powdered-coal furnace with a combustion space of 9,057 cu.ft. Boiler has 13,057 sq.ft. water heating surface. Illinois coal was burned.

	Test No. 3	Test No. 4
Steam pressure by gage, lb. per square inch	264.2	266.7
Temperature of superheated steam, deg. Fahr.	584.7	596.1
Temperature of feed water entering boiler, deg. Fahr.	203	213.2
Temperature of feed water entering economizer, deg. Fahr.	132.3	130.5
Temperature of escaping gases:		
a. Temperature of gas below fourth pass, deg. Fahr.	470	526
b. Temperature of gas entering economizer, deg. Fahr.	436	464
c. Temperature of gas leaving economizer, deg. Fahr.	240	268
Evaporation per hour from and at 212 deg. Fahr., lb.	61,934	92,013
Boiler horsepower developed, hp.	1,795	2,667
Percentage of rated capacity developed, per cent	137.4	204.2
Water fed per pound of coal, as fired, lb.	8.5	8.51
Equivalent evaporation from and at 212 deg. Fahr. per pound of dry coal, as fired, lb.	9.93	9.90
Calorific value of 1 lb. of coal as fired, per analysis, B.t.u.	11,449	11,581
Efficiency of boiler, furnace, superheater and economizer based on coal as received, per cent	89.3	89.001
Coal Analysis (by T. M. E. R. & L. Co. Laboratory):		
Moisture, per cent	4.2	4.05
Ash, per cent	13.395	13.337
B.t.u. per pound of dry coal, B.t.u.	11,950	12,070
B.t.u. per pound of coal as received, B.t.u.	11,440	11,581
Sulphur, per cent (separately determined)	3.81	3.422

A Few Timely Reminders on Industrial Lighting

IN THE choice of reflector fittings for lighting service consideration must be given to the class of work to be done, the area to be illuminated, location of operatives and machines, ceiling height and so forth. For a wide variety of industrial locations the "RLM" metal-dome reflector with the bowl-enameled or bowl-frosted lamp is very desirable and one of the most popular forms of equipment at the present time. This combination gives a direct lighting of full-illumination value, but with softened shadows and freedom from glare, and is the type of lighting particularly recommended for machine shops.

High Level of Illumination Relieves Contrast

Wherever possible local lighting should be avoided. In many instances it can be dispensed with entirely. This can be made easier by the advantage gained from the development of a more efficient overhead lighting system. Even when local lighting is necessary, a high level of general illumination relieves the contrast between the brightly lighted work and the remainder of the room, besides proving restful to the operatives' eyes. Care should be exercised in choosing the size of reflector equipment to get it suitable to the size of lamp selected. Reflectors with larger or smaller diameters than they should have will give poor light distribution.

The burning of lamps at undervoltage from any cause results in a decrease in wattage, and therefore a decrease in bills, but since this decrease in wattage is acompanied by twice as great a decrease in illumination, it really causes a net loss. In instances where a considerable increase in lighting intensity has been made or may be under consideration it is important to investigate the amount of voltage drop caused by the increased load. The voltage delivered at the service switch may be up to standard, but if the circuits are overloaded, poor illumination and decreased wattage will result. In any instance where the desire to cheapen the wiring installation results in the installation of insufficient copper the voltage drop will be excessive, the illumination decreased and the lamp efficiency impaired.

It is oftentimes found that individuals who do not fully appreciate all the effects are purposely using lamps with a rated voltage higher than the circuit voltage for the purpose of increasing the life of the lamps. In practically no case is such a practice justifiable, for the cost of the energy consumed by a lamp is so much greater than the cost of the lamp that it is not economical to sacrifice even a small part of the efficiency of the lamp for the sake of even a considerable decrease in the renewal cost.

To secure light efficiently purchase lamps of known quality and of correct circuit voltage. Lamps have an average life of a thousand hours and will maintain their luminous efficiency with but little variation.

Here is a single fact that would save hundreds of dollars if it were generally acted upon. The loss of illumination due to the coating of lamps and reflectors with dirt may equal 60 per cent or more. Think of what this means in energy consumption, loss of production, waste of materials and risk of accidents, and then realize that the saving can be made by a simple plan of cleanliness—a periodic cleaning of lamps and reflectors just with soap and water. Shop cleanliness is a matter of routine. Why not extend it to the lighting units?

Foot-Candle Meter Quickly Repays Its Cost

It is surprising to see the way in which lamps are neglected and new and larger units sometimes put into sockets where the only trouble was need for clean water. This is where the use of the foot-candle meter to check up lighting values is going to repay its cost.

Finally, there is the question of shadows. For satisfactory lighting there must be no sharp black shadows to confuse the vision. Shadows are usually present when the illumination is not uniform. It would need expensive equipment to eliminate shadows entirely, but this is not necessary or desirable, because a certain amount of softened shadow is requisite for the easy definition of objects.

Unfortunately, much indifference has to be overcome to make plain the fact that lighting plays an important part in modern industrial plants. There are many Topsy systems that have "just growed." Faulty and insufficient lighting costs in the end far more than efficient illumination. Poor lighting reduces production and increases shrinkage—a loss of time and money.

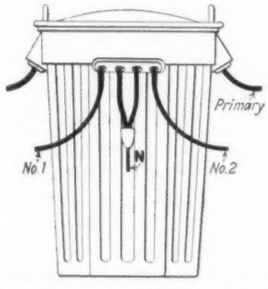
An increase of four times the lighting intensity will cost a sum that is but a fractional percentage of the payroll, and the sum spent will be well repaid by measurable increase in production. To insure more attention to illumination is only a matter of the possibilities of its service to industry being seen by responsible executives. Lighting has power to stimulate, and where it is adequately used there is little chance for error, accident or idleness.

F. H. SWEET.

Waynesboro, Va.

Simplifying Secondary Tagging

TO SIMPLIFY the tagging of secondary leads and wires, linemen of the Worcester (Mass.) Electric Light Compar. are furnished with loose-leaf data sheets, about 3¾-in. x 6¾-in. in size, showing the standard method of numbering used by this central-station company and



DESIGNATING TRANSFORMER TERMINALS IN SIMPLE MANNER

Where it is necessary to tag the secondary wires of a system, use figures No. 1, N, and No. 2 instead of the words left, neutral and right.

illustrated herewith. The scheme is a simple one, but is complete and accurate, depending on numbering from left to right when facing the secondary side of the transformer. In balancing three-wire, single-phase systems it is convenient to identify the wires by numerals and the letter "N" for the neutral instead of attempting to follow the "left" and "right" designations. All data sheets prepared for the use of line crews, whether for overhead or underground work, are reduced to the simplest feasible terms, and only the essentials are illustrated in connection with cable and pole-line layouts, transformer location, etc.

A. D. PUTNAM.

Worcester Electric Light Company, Worcester, Mass.

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Interpreting the Central Station in a "Year Book"

Commonwealth Edison Company Issues
Its Annual Report as an Illustrated Story
of the Company's Condition and Progress

ONE of the most interesting developments of the Commonwealth Edison Company's customer-ownership program is a year book which has just been issued by the company so that its stockholders may be more full acquainted with the details of the property in which they now have ownership. This book, the cover of which is shown here, has been carefully prepared and contains a condensed record of the company's growth, telling the story of the service it renders in clear, understandable language.

Of particular interest is the manner in which the company's income account and balance sheet have been presented. The accounts which appear in the regular annual report are given in their usual order, but a notation under each item explains in detail just what goes to make up that particular charge. For instance, the company's operating revenue for the year ended Dec. 31, 1921, is shown thus:

Electric operating revenues..... (This was the total amount paid by or billed to the 536,982 customers for electric services. The customers increased 62,200 during the year.)	$37,139,830.64
Electric operating expenses..... (This was the amount paid out as wages to the 5,969 employees, and the cost of coal, lamps and other materials and supplies used. It includes $2,900,758 set aside to cover wear and tear on the plants and machinery—depreciation.)	24,396,155.35
Net electric operating revenues.. (This was left for payment of expenses other than those having to do directly with production, distribution and general expenses as outlined in the items to follow.)	$12,743,675.29

Following come the various items of incollectible operating revenue, taxes, municipal compensation, net operating income, other income, gross income, deductions from gross income, interest on funded debt, amount available for dividends, dividends paid and balance carried to surplus—each entry clearly and concisely explained in words that tell the story no matter how inexperienced the reader may be in studying financial reports—and the total surplus remaining is shown as follows:

Total surplus of the company..... (This was the total amount the company had providently laid by over a course of years as protection for its stockholders and also as a guarantee of efficient service to its customers. Having faith in itself, this has been reinvested in the company's assets, and represents an added invested interest each stockholder has in the property beyond the $100 par value of each share of stock. It represents an additional investment made for each stockholder, for instead of dividing the full profits through payment of larger dividends, part of this money is permitted to go back into the business. It is this reinvested surplus, as well as the good dividend rate, which gives Commonwealth Edison stock a much higher salable value than its $100 par value, as it gives added security to the investment.)	$9,183,217.26

The balance sheet is defined as "a statement of what the company owned and what it owed on Dec. 31, 1921," and these typical entries under "assets" illustrate how each item is made clear:

Cash..... (This money was in the bank.)	$1,376,519.14
Special deposits..... (This little item covered amounts that had been advanced in connection with improvement work and would be refunded.)	9,059.09
Prepaid insurance..... (Insurance paid for in advance. The company partially insures itself by setting up a fund.)	83,063.90
Total assets..... (This was the total value of the belongings of the company.)	$152,035,420.70

Under "liabilities" these are some of the interesting items:

Loans and notes payable..... (A going business often needs money for various things it is doing and does not want to "pinch" itself by drawing on its own resources, so it obtains temporary loans at the bank.)	$750,000.00
Total current liabilities..... (This was the total of debts of this character in process of being paid.)	$4,432,764.23
Premium on funded debt..... (This was the amount above par the company has received in the sale of its bonds.)	$20,478.68
Total liabilities..... (This represented the total obligation of the company on Dec. 31, 1921, either for ordinary debts for fuel, materials, equipment, etc., or owing to bondholders, to the company itself or the stockholders. It balances with the total of assets.)	$152,035,420.70

As can be seen from these entries each account is so explained that even though the reader may not be familiar with the form of a bare financial statement he can readily understand the report.

COVER OF COMMONWEALTH EDISON'S "YEAR BOOK"

In the introduction, President Insull's address to stockholders at the annual meeting is given. In this he pointed out matters of direct concern to the stockholders. In part he said:

"The Commonwealth Edison Company is distinctly a Chicago institution. It is not owned by just a few capitalists, but has 24,571 stockholders. Ninety-two per cent of these stockholders live right in Chicago, and only a little more than 4 per cent of them live in Illinois outside of the city. This ninety-six per cent of stockholders own upward of ninety per cent of the company's stock, so the company is essentially a home institution.

"We want to go on increasing the number of our stockholders. We want this property to be absolutely owned by this community as individuals. We do not want to see it owned by the community as a municipality. We do not believe that the best results in operating this or any other form of public utility service can be obtained under the extravagant methods that are incident to municipal management. We

do believe that, if the community as individuals own our property and if every customer we have on our books is also a shareholder, the stability of our investment will be enhanced and the best interests of the community which we serve will be advanced."

Included in the "Year Book" are a number of interesting charts, illustrating a detailed description of the growth of the company, the volume of its business and economic aspects of the service which it is rendering.

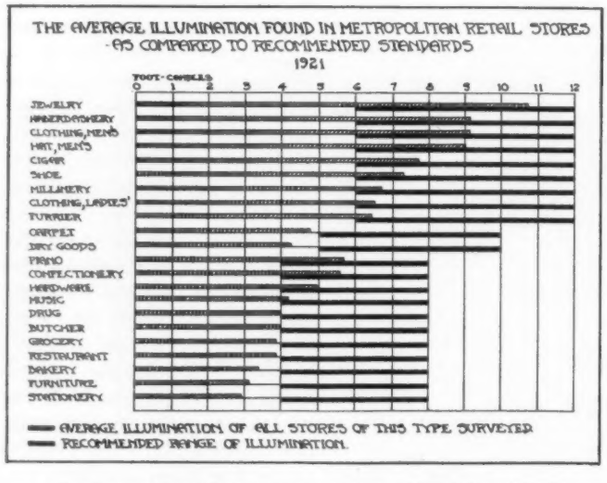
The Commonwealth Edison Company in issuing this "Year Book" has hit upon an excellent method of laying its business before its stockholders and the public in a manner which is at once clear and understandable. It explains the public utility and how it works and should return big dividends in good will.

Possibilities in Better Store Lighting

INVESTIGATIONS of store lighting conducted during the past year by the Lighting Sales Bureau of the N. E. L. A., of which L. R. Wallis was chairman, have revealed enormous possibilities for increasing the central-station company's revenue from this source as well as increased sales of commercial lighting equipment. A survey of store lighting in the business center of Newark, N. J., shows results which are typical of conditions prevailing throughout the country. The accompanying composite chart shows the existing and recommended values of illumination in the various classes of retail stores. It is interesting to note in the chart that almost half of the stores shown do not even come up to the foot-candle value recommended.

An interesting sidelight on the commercial lighting situation is the attitude of the merchants regarding their existing installations. When approached, 20 per cent volunteered the information that they were dissatisfied with their lighting even before possible improvements were mentioned. Of the remaining 80 per cent the majority were satisfied, but this was only because they did not realize their lighting mistakes. The average storekeeper does not have to be "sold" the idea of better lighting, as he is too good a merchant not to appreciate the pulling power of light, but he must be taught just what constitutes good lighting.

Jewelry and haberdashery stores are well up in recommended values, and although their lighting equipment may be incorrectly placed or may be of an obsolete type, these stores will not ordinarily be good prospective customers for increasing merely the foot-candle illumination. The efforts directed toward such stores must be chiefly of an educational nature, without great immediate profits through sales of material or power, but of considerable value in the correction of glare and maintenance evils—in other words, the firmer establishment of the electric light and power utility as a true service company.



EXISTING AND RECOMMENDED STORE LIGHTING VALUES

Lower Prices Cause a Resumption of Range Sales

OWING to improvements in electric ranges and to reductions in prices from increases to which it took exception in the summer of 1919, the Hartford (Conn.) Electric Light Company has announced its reentry into the field of electric range merchandising. The withdrawal of the company from this field caused considerable comment in central-station and manufacturing circles at the time, and since then the company has confined itself to filling orders for ranges from customers who desired them regardless of the company's declining to push such sales under conditions then prevailing.

Ranges are being sold, if desired by the customer, on installment payments over a period of one year. Prices include installation and wiring. Many inquiries have resulted from the company's announcement, and it is looking forward to a healthy demand for ranges in the coming months. For the first time in nearly three years ranges are now being displayed in the company's show windows.

What Other Companies Are Doing

Oklahoma City, Okla.—The Oklahoma Gas & Electric Company has signed contracts for electric service with the towns of Oilton, Jennings and Cleveland, and takes over the plant at Oilton on July 1. Eleven miles of 13,000-volt line will be built in time to operate the substation in Fairmont early in July.

Haverhill, Mass. — Seventy-two buildings with 110 electric meters were wired during the first eight weeks of a house-wiring campaign run by the Haverhill Electric Company, according to the Boston office of Charles H. Tenney & Company, managers of this utility. The campaign is being run on the basis of local newspaper and direct-by-mail advertising. Local contractors are being paid in cash direct by residence customers.

Mattoon, Ill.—The employees of the Central Illinois Public Service Company did not merely break their stock-selling record when they sold 2,635 shares of their company's preferred stock during the month of April, but more than doubled their previous high mark made in the month of March.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Hydro-Electric Development and Steam Equipment

Murg Hydro-Electric Plant in Baden.—C. LIEBISCH.—Utilizing a head of 145 m., the present installation at this large plant comprises five 5,000-kva. Francis spiral turbines, consuming a total of 17½ cu.m. of water per second. As it is intended to add to the station in the near future further units of 20,000 kva. each, the generator voltage has been fixed at 10,000. A short distance from the high-head plant the discharge water is used again in a low-head station with two 650-kva., 3,000-volt generators. Two three-phase oil-cooled transformers of the core type, with a rating of 10,000 kva., 10,000 volts to 110,000 volts, energize the transmission line. For the supply of near-by consumers two 5,000-kva., one 1,000-kva., one 1,200-kva. and one 500-kva. transformer with secondaries of 10,000 volts and 20,000 volts are also provided. The entire transforming and switching apparatus is under roof. To be able to regulate the voltage of the departing 20,000-volt lines independently from the 110,000-volt lines, a 12,500-kva. induction regulator has been inserted into the 10,000-volt buses. — *Elektrotechnische Zeitschrift*, April 20, 1922.

Forestry and Hydro-Electric Development.—ARRIGO SERPIERI.—Account of a conference held at Milan on Feb. 9 between the Federazione Pro-Montibus (a national body devoted to forestry) and the Italian electrotechnical societies in which the relation of forestation to stream flow was discussed.—*L'Elettrotecnica*, April 15, 1922.

Generation, Control and Switching

Protective Apparatus for Turbo-Generators. — J. A. KUYSER. — The causes of electrical breakdowns on turbo-alternators and methods of preventing damage to the equipment when trouble occurs are discussed. A new system is described for eliminating some of the shortcomings of existing methods.—*Electrician*, May 5, 1922.

Use of Time Lags in Connection with Protective Gear.—MAJOR KENELM EDGCUMBE.—Time lags are usually introduced in relay protective apparatus to avoid opening the circuit at the moment of maximum fault current and to give discriminating action in the case of a number of circuit breakers connected in series at different points on the system. A consideration of the short-circuit current of a generator demonstrates the advantage gained by delaying the action of the circuit breaker by half or three-quarters of a second in that the current to be broken is during that time reduced to one-fifth of its peak value. Other points discussed are leakage protection, possible disadvantages of time lags and definite versus inverse time lags.—*Beama*, April, 1922.

Calculation of an Economic Reactor Without Iron.—J. HAK.—A formula is derived for the most economical current density in the copper windings of an air-core reactor. The influence of variable load and of the shape of the coil upon the economy of the reactor is investigated. Only cylindrical coils and round flat coils are considered, as it is impossible to find sufficient cooling surface in other shapes of coils. A numerical example of a cylinder coil is given to illustrate the method.—*Elektrotechnik und Maschinenbau*, April 16, 1922.

Transmission, Substations and Distribution

Electro-Agricultural Week at Stockholm.—T. HOLMGREN.—A brief résumé of the proceedings of the "electro-agricultural week" held in Stockholm, Sweden, in March of this year to discuss the economy and future of rural electrification. The main topics covered were the organization of rural distribution and the development of the rural power market. Several recent applications of electricity to farm work were discussed, among which were electric silos, electric plows, "earth milling machines," watering devices, etc.—*Teknisk Tidskrift*, April 1, 1922.

Power Factor in Transformers and Transmission Lines.—O. BURGER.—The amount of wattless current in transformers and long transmission lines is calculated, and the author shows that by proper compensation between inductance and capacity of lines it is possible to transmit large energies over long distances without any appreciable losses other than ohmic losses. The most favorable voltage depends then only upon the amount of transmitted energy. Such load and voltage ratios are, for example, 30,000 kw. with 100,000 volts, 60,000 kw. with 150,000 volts, 110,00 kw. with 200,000 volts, and 175,000 kw. with 250,000 volts. Considering transmission lines of very high voltage, it is pointed out and shown graphically that they must be operated at a high power factor in order to give satisfactory voltage regulation.—*Elektrotechnische Zeitschrift*, April 20, 1922.

Mechanical Stresses in Transmission Lines.—E. MAERKER.—Engineers dealing with transmission-line problems have long felt the need of a simple comprehensive chart applying to all cases which are likely to come up. The author has developed charts applicable for any ice and wind loading and any temperature for horizontal spans of 100 ft. to 1,500 ft. and supports at the same or different elevations. The charts developed are for copper wire only.—*Canadian Engineer*, April 25, 1922.

Units, Measurements and Instruments

Direct-Reading Ohmmeter. — C. DUFRÈNE.—The measurement of the insulation of direct-current distribution networks is made frequently either incorrectly or with an irksome amount of calculation. A method is suggested by the author based upon previous investigations made by Stubbings in England. In this method a portable instrument uses the current of the line itself and therefore permits the making of measurements on a live line. A high resistance is then placed across the supply line, with a sliding contact near its middle. A sensitive voltmeter is then connected between this contact and the ground. A point is found on the potentiometer which gives at the voltmeter the full-scale deflection. A fixed shunt resistor is then placed in parallel with the voltmeter, which reads now on the scale directly the total resistance in ohms to ground. A double-throw switch and an inbuilt auxiliary resistor give the instrument a direct scale as well as a one-tenth scale reading for higher voltages.—*Revue Générale de l'Electricité*, April 1, 1922.

Precision Measurements in X-Rays for Roentgenologists.—MONTFORD MORRISON.—The method of measuring electrical energy in an X-ray tube by reading a parallel spark gap at the tube and the milliamperes flowing through the tube does not give the correct measurements of energy or power. This is because of the wide change in the form of the voltage applied with different settings of the control. Means are outlined for the measurement of voltage and current and for obtaining their wave form.—*Bulletin of the International X-Ray Corporation*, Vol. 1, No. 2.

Illumination

Lighting of Factories and Mercantile Establishments.—H. D. SAYER. — The Industrial Code rules relating to factory and store lighting as recently amended are given. The intensities sanctioned for outdoor and indoor illumination in many industries are enumerated in table form.—*Bulletin No. 18, Department of Labor of New York.*

Ultra-Violet Light, Its Uses and Possibilities. — LLORA C. KRUEGER. — Utra-violet light is an artificial light produced electrically and has a different wave length from the visible spectrum, which means that it has different characteristics and applications from ordinary light. Some of the more important characteristics are dealt with.—*General Electric Review*, May, 1922.

Motors and Control

Sand-Filled Starting Resistances—Owing to the difficulty of obtaining oil and its high price, one company has developed a motor starter, the resistors of which are placed in a cast-iron container filled with fine sand. This gives an inexpensive, fireproof and leak-proof construction.—*Elektrotechnische Zeitschrift*, April 20, 1922.

Single-Phase Commutator Motors.—N. PENSABENE-PEREZ.—The single-phase commutator motor is coming more and more into favor on account of certain characteristics that induction motors do not have and which are discussed by the author. These characteristics are powerful starting torque, moderately small current at starting, simple starting switch, good power factor and good range of speeds by simple control.—*Electrical Review*, April 28, 1922.

Heat Applications and Material Handling

Pneumatic Coal-Handling Plant.—A description is given of this type of coal-handling plant recently installed at the Bankside generating station of the City of London Electric Lighting Company. Although this method appears at first sight to be somewhat expensive, the system offers the advantage of enabling the fuel to be unloaded from barges with great rapidity, which more than compensates for the cost.—*Electrical Review*, April 28, 1922.

Electrophysics, Electrochemistry and Batteries

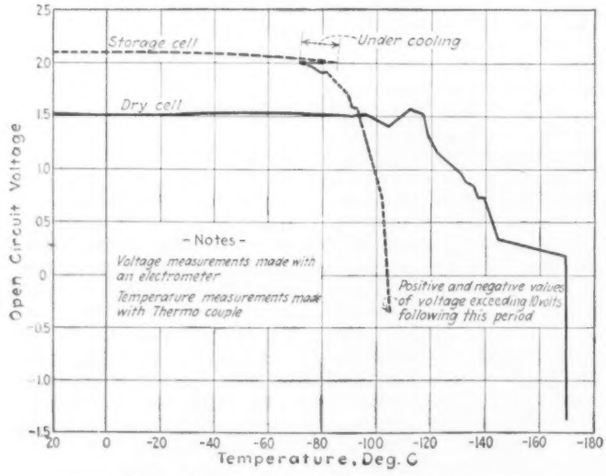
Electromotive Force of Cells at Low Temperatures.—G. W. VINAL and F. W. ALTRUP.—The practical importance of a knowledge of the electromotive behavior of dry cells and storage batteries at low temperatures has arisen from their use in the Arctic and at high altitudes. Measurements on dry cells and storage batteries artificially cooled to —170 deg. C. were made. The Gibbs-Helmholtz equation was applied to the observations, and excellent agreement between theory and observation was found. The results on the battery voltages over the wide temperature range covered are shown in the accompanying illustration.—*Scientific Paper No. 434 of the Bureau of Standards.*

Traction

Electric Locomotives Rated at 1,200 Hp. for Metropolitan Railway.—Twenty of these locomotives have recently been placed in service on the Metropolitan Railway Company's track in England. Each locomotive has four 300-hp. self-ventilated motors with an operating performance of 60 watt-hours per ton-mile guaranteed by the manufacturer.—*Engineering*, April 7, 1922.

The Question of Inductive Interference and Electrolysis Relating to Railroad Electrification.—CHARLES F. SCOTT.—It is generally agreed that inductive interference and electrolysis are matters which should be taken into consideration when an electrification is being planned. Provision should be made at this time to prevent difficulties arising during construction. On general principles the plan should be that which is cheapest, whether this means special arrangements in the power system or in the telephone system, or separation of the two.—*Electric Journal*, April, 1922.

Recent Improvements in Railway Electric Traction Equipment.—ROGER T. SMITH.—The author discusses the relative financial advantages in England of steam and hydraulic stations and shows that generally, for agricultural reasons, the former will continue to be used. He gives the details of a new machine for converting alternating to direct current and brings up to date the figures for the cost of haulage by electricity and steam which he had formerly compiled.—*Electrician*, May 19, 1922.



OPEN-CIRCUIT VOLTAGES OF DRY CELLS AND STORAGE BATTERIES AT LOW TEMPERATURES

Telegraphy, Telephony, Radio and Signals

A New Underground Telephone System.—A cable has recently been placed in service between London and Manchester, a distance of 183 miles, which is equipped with repeaters and loading coils. It has been possible to reduce the weight of copper in the conductor as compared with long-distance cables which are not similarly treated from 200 lb. to 40 lb. (90 kg. to 18 kg.) per mile. The recent development of underground telephone work in England is reviewed.—*Engineering Section, Times (London) Trade Supplement*, April 22, 1922.

Alternating-Current Bridge to Measure Apparent Resistance of Telephone Cables.—K. KUPFMÜLLER and P. THOMAS.—To measure the alternating-current resistance of telephone cables the bridge method is employed to great advantage. Difficulties arise, however, if cables already installed have to be measured, because the capacities of the current supply of the telephone and the other apparatus against ground affect the results in an uncontrollable manner. In such a case an improvement of the Wien bridge is suggested wherein an auxiliary resistance which duplicates the bridge branches makes the arrangement symmetrical against the ground. Results obtained with such a modified bridge indicate a great accuracy of measurements of capacity and leak current on cables.—*Elektrotechnische Zeitschrift*, April 6, 1922.

Modern Telephony Technically Considered.—J. G. HILL.—The author deals with the effect of loading and the use of thermionic amplifiers in providing efficient long-distance telephone communications by means of small-gage conductors in underground cables. A review of the theory of superposed circuits worked at audio frequencies is given.—*Electrician*, April 7, 1922.

Miscellaneous

Electricity and Safety First in Factories.—W. H. SEAL.—The article is written to stimulate interest in the important problem of how safety can best be insured in factories. The author suggests a code of safety rules and calls attention to the legislative difficulties which prevent the full development of "safety first" measures. Certain precautions desirable in using electrical machinery are discussed in detail.—*Electrician*, May 26, 1922.

The Theory of Water Hammer.—CARLO FOSSA MANCINI.—A mathematical treatment, with tables and diagrams, outlining a method of calculating the maximum force of water hammer in a given installation.—*L'Elettrotecnica*, April 15, 1922.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Congress Votes to Continue Work at Muscle Shoals

The House of Representatives on June 24 agreed to concur in the Senate amendment to the War Department appropriation bill which appropriates $7,500,000 for the reopening of construction work on the Wilson Dam at Muscle Shoals. The vote carried with it, however, approval of an amendment by Representative James of Michigan which provides that no portion of the $7,500,000 is to become available before Oct. 1. The Senate on June 27 concurred in the House amendment, and President Harding's signature is all that is now required to make the appropriation effective.

Coal Production Again Increases

Prompt recovery from traffic congestion, which had interfered with placement of cars at mines in Kentucky and West Virginia, resulted in a sharp increase in bituminous coal mined during the week ended June 24.

The tragic happenings at the Herrin (Ill.) mines have led to increased talk of intervention by the federal government. A statement given out at the White House on Tuesday said: "In the coal strike the government has hitherto worked along the lines of persuasion and voluntary adjustment. If that does not produce results looking toward settlement, a very much more pointed and drastic course may have to be taken."

President Harding on Wednesday invited representatives of the operators and miners in the unionized districts of both the bituminous and anthracite coal industries to meet with him at the White House on Saturday morning "to devise methods upon which negotiations for the settlement of the coal strike can be initiated."

Murder of Rathenau Blow to German Electrical Interests

In the assassination of the statesman and financier Walter Rathenau, Foreign Minister of the German Republic, the electrical manufacturing interests of Germany have suffered a heavy loss, for Dr. Rathenau, who was a noted economist and company executive as well as a public man, had exercised a powerful interest in the control of the Allgemeine Elektricitäts Gesellschaft since the death of his father, Emil Rathenau, in 1915. The senior Rathenau was long the head of the A. E. G., as the company is commonly known, and amassed a great fortune, partly through the ownership of European rights in Edison patents. His son succeeded him in control, resigning official connection with the company when he entered political life.

Walter Rathenau was born near Berlin Sept. 29, 1867. After attending the gymnasium he went to the Charlottenburg Technical College, and later took advanced degrees at the universities in Strasbourg and Berlin, where he distinguished himself by his scholarship. He studied philosophy, physics, chemistry and engineering, becoming also an accomplished linguist. He came into political prominence in 1914 and at the time of his death was an outstanding figure in the efforts put forth by the German government to adjust the question of reparations with the Allies. He was regarded as the leader of those opposed to Hugo Stinnes and the nationalist reactionary faction.

Bill to Extend Salt River Power Leases

A bill extending from ten to fifty years leases of surplus electric power on the Salt River reclamation project in Arizona has been passed by the House of Representatives. Provision is made that the charges for power may be readjusted at the end of five, ten or twenty-year periods. In support of the bill Representative Hayden of Arizona pointed out that it was designed to equalize conditions on the Rio Grande project in Texas and New Mexico and that the federal power act authorized fifty-year leases. Mr. Hayden explained that certain mining companies, in order to bring surplus hydro-electric power from the Salt River project, had advanced $430,000 for the construction of transmission lines. Under contract approved by the Interior Department the companies will be reimbursed for this outlay within ten years by taking pay in power.

Development of other power units is now planned, and the expense will be so great that a longer period of time is necessary in which to repay the cost, explained Mr. Hayden. He added that the proposed legislation would allow $1,000,000 or $2,000,000 to be expended on the power plants and transmission lines, title to which will remain in the government as security for the $9,000,000 which the water users have promised to pay the United States.

Radio Testing Methods Are Approved in Outline

The Bureau of Standards of the Department of Commerce and the Electrical Testing Laboratories of New York have approved in outline a method for immediate use in the testing of complete receiving sets manufactured for receiving radio-telephone broadcast messages or programs. Improvements on these methods or new methods used in testing the equipment submitted by the National Retail Dry Goods Association will be subject to approval of the Bureau of Standards, which will co-operate with the Electrical Testing Laboratories in the establishment of these methods as standard procedure.

Engineering Societies of Boston Affiliate

Nine engineering societies with a total non-duplicating membership of about 3,500 have completed organization as the Affiliated Technical Societies of Boston and have established headquarters at 715 Tremont Temple, in the premises formerly occupied by the Boston Society of Civil Engineers and the New England Waterworks Association. The affiliation was granted a charter by the State of Massachusetts on June 12 and is the outgrowth of various informal meetings during the past year designed to accomplish more effective co-operation and advancement of interests in the engineering profession in eastern New England. The participating organizations consist of the Boston Society of Civil Engineers, which is the oldest engineering organization in America; the Boston sections of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the American Institute of Mining and Metallurgical Engineers, the New England Waterworks Association, the Plant Engineers' Club, the Northeastern Section of the American Society of Civil Engineers, the Massachusetts Chapter of the American Society of Heating and Ventilating Engineers, and the Boston Chapter of the American Association of Engineers.

The objects and functions of the affiliation include the concentration of a united membership on questions of engineering importance to governmental, public and professional interests; the correlation of local group activities to eliminate former overlapping activities, conflicts of effort and duplication of

meetings; improvement of the standing of technically trained men, and promotion of acquaintance, furtherance of technical activity and increased esprit de corps among organization members.

Headquarters will be maintained for the benefit of resident and non-resident technical men, with facilities for meetings and correspondence, with an employment clearing bureau and extensive reference library of engineering books and periodicals. The officers of the affiliation council are: Chairman, Leonard Metcalf; vice-chairmen, Alfred S. Kellogg and Alexander Macomber; treasurer, Charles L. Hammond; clerk, W. G. Starkweather; executive secretary, J. B. Babcock.

St. Lawrence Commission Favors Further Investigation

The International Joint Commission on Boundary Waters, which is the body investigating the feasibility of the St. Lawrence waterway and power project, has given out for publication the final report and recommendations that it makes to the two governments interested. The recommendations, eleven in number, are favorable to the project and suggest a method for dividing the work and the cost between the United States and Canada.

One paragraph in the report. however, meets with the approval of those opposing the plan—a recommendation for further investigation before final action is taken. This paragraph recommends "that the proposed works between Montreal and Lake Ontario be based upon the report of the engineering board accompanying this report, but that before any final decision is reached the report of the board, together with such comments, criticisms and alternative plans as have been filed with the commission, be referred back to the board, enlarged by other leading members of the engineering profession, to the end that the question be given that further and complete study that its magnitude and importance demand."

Iowa Convention Considers Many Subjects

Inductive Interference, Group Insurance, Selling Securities to Customers, Readiness-to-Serve Rates, Rural Service and Electric Cooking Discussed

THE discussion of the inductive-interference problem at the meeting of the Iowa Section of the National Electric Light Association at Lake Okoboji, Iowa, last week, briefly referred to in the *Electrical World* for June 24, was opened by J. M. Drabelle, past-chairman of the inductive interference committee, who presented a report on the present status of the work. Austin Burt presented the report of the general joint committee representing the N. E. L. A. and the American Telephone & Telegraph Company. Both speakers urged the utmost support for the work that the joint committee is doing.

John Reed of Cedar Rapids spoke of the ease with which it had been possible to handle the problems with the Bell Telephone Company in a co-operative way and asked that every effort be made to extend that co-operative effort to the independent telephone companies in the state.

Characterizing brain power, muscle power and good will as the marketable assets of the man who works with his hands, Peter F. Bouquet of St. Louis presented group insurance as a means of bringing good will into the brain and muscle work of the employee so that he will be of greater value to himself as well as to the employer. His assertion that group insurance is a valuable asset in an organization was strongly backed by F. J. Hanlon of Mason City, who cited instances of its utility in business establishments in which he is interested.

E. E. Sanford, Northern States Power Company of Minneapolis, discussed the sale of securities to customers. He did not point to it as a cure-all in public relations, but said that it can be made of great usefulness. He urged the need of care in selling, stating that securities on which dividends might by any possibility be suspended should not be sold. The need of protecting the market and establishing a resale market was urged by Mr. Sanford and also by President Dows.

That the readiness-to-serve form of electric power and lighting rate is desirable as a matter of justice and policy was the view expressed in a paper by Prof. J. B. Hill of Iowa State University. This form of rate is just, Professor Hill asserted, because the costs involved in the service are properly set up and allocated, so that each class of consumers carries its proper share with no shifting of costs to other classes. He also said that from the viewpoint of policy this form has all the good points and none of the bad ones of the minimum-charge form, which always leads consumers to limit consumption strictly. The readiness-to-serve charge had been attacked as a form of meter rental, but the courts had not sustained this contention.

The slogan of "Service at cost," advocated in the report of the committee on electric service rates, raised a protest because of the assertion that no item of profit is to be found in any of the costs entering into the various rates for service and that the item of return on investment should be referred to as the interest rate earned on the value of the property. Those protesting against this statement did so on the ground that the public, if rightly informed, would accept a reasonable profit item in the rates.

N. T. Wilcox of Keokuk supported the readiness-to-serve form of rate schedule, and John A. Reed of Cedar Rapids called attention to the demand for the adjustment of the rates downward, which, he said, must come as soon as the cost of coal reaches a lower point, and to the increase in cost to the smaller consumer which this form of rate would bring about.

The report of the rural-lines com-

DELEGATES AND GUESTS OF THE PACIFIC COAST DIVISION, N. E. L. A.,

mittee reviewed the ground already covered in committee work and followed the report of the committee of the National Electric Light Association in its analysis of the features of various plans. The risk of the business falling off because of migration from the country to the cities was alluded to, and the fact that the high costs of the service as compared with the same service in the cities would bring a slow development and a possible loss in the development period was dwelt upon. It was also held that financing from the proceeds of stock sales to the prospective customers was in effect the same thing as if the utility advanced the cash and, in fixing rates, should be treated in the same way.

N. T. Wilcox of Keokuk, in a discussion of the essentials of electric cooking rates, said that the average residence lighting customer yields an annual gross income of about $20 and indicated the possibility of increasing this figure to a total of more than $100 per kilowatt of station demand by encouraging the use of the electric range. Arthur Huntington of Cedar Rapids cited an experience in one Iowa town of about 500 population in which forty-eight ranges are installed with twenty hot plates. With the secondaries interconnected he said that a diversity factor of eight to one is certain. The town is served from a 40-kva. transformer connected to a high-tension line and the maximum load with all the ranges in service has been less than 40 kva.

In reviewing legal decisions of interest to the Iowa utilities, John A. Reed of Cedar Rapids took occasion to point out that the decisions of the courts had not been of a character to justify any one in saying that any one method of arriving at property values could be accepted to the exclusion of all others. He said that no mathematical formula had been developed and that original cost, the five-to-ten-year average, present market prices, depreciation and all other plans were indicated by court decisions as factors.

The officers elected for the coming year are: President, C. N. Chubb, Davenport; first vice-president, C. A. Sears, Keokuk; second vice-president, Don Sterns, Humboldt; treasurer, M. G. Linn, Des Moines.

A. M. E. S. at Spring Lake

Bad Weather Shortens Meeting One Day —The 660-Watt Rule—Legal Aspect of Trade Associations

With the co-operation of the weather, the Associated Manufacturers of Electrical Supplies finished the work of the annual meeting so promptly that the meetings of the final day were canceled. About 250 members were in attendance at the Hotel Essex and Sussex, Spring Lake, N. J., June 19 to 23. It rained so continuously that golf was greatly interfered with, and the sections continued their sessions through the afternoons and evenings, making it possible to advance the general meeting to Thursday.

President Shiras Morris, in his address, voiced the happier frame of mind of the membership since the last annual gathering, when the manufacturers were much depressed over the business outlook. "Most of us," he said, "have been happily surprised at the rapidity of readjustment, and we are apparently again on the upgrade."

A very interesting presentation of the record of the Electrical Manufacturers' Council was made by S. L. Nicholson, chairman of the council. He sketched the history of the council and of the earlier influences which led to the organization of the three member associations, and outlined in detail the work which has been accomplished by the council in contact with the Department of Commerce, the American Safety Council, the Fire Insurance Underwriters and the National Electric Light Association, as well as in the field of cost-accounting statistics, tariff and simplification. He discussed at length the recent acceptance of the code by the American Engineering Standards Committee and the influence which this should have on the development of the code as an American standard, under the control and guidance of all the interests naturally concerned. The success which has come through conducting co-operative activities with other associations through the appointment of special joint committees was described and heartily approved.

The association indorsed the revision of the 660-watt rule in the code to permit the wiring of twelve outlets as a branch circuit without regard to the possible number of sockets to be installed, provided that protection is afforded by a 10-amp. fuse.

Judge Debevois discussed the present legal aspect of the trade association and announced that the celebrated Mennen case has been appealed. He urged that members of the association contribute their statistics for clearance through the Department of Commerce. A new basis for the assessment of dues was proposed and adopted to provide more money in order that the work of the A. M. E. S. may be further extended. The following new directors were elected to serve for three years: S. L. Nicholson, Westinghouse Electric & Manufacturing Company; Waldo C. Bryant, Bryant Electric Company; C. E. Corrigan, National Metal Moulding Company; Edward Sawyer, Atlantic Insulated Wire Company, and W. H. Bliven, Harvey Hubbell, Inc.

American Society for Testing Materials Reports Progress

Meeting at Atlantic City on June 26 to June 30 on its twenty-fifth anniversary, the American Society for Testing Materials listened to an address by its president, C. D. Young, general supervisor of stores, Pennsylvania System, in which he gave a brief outline of the society's history and work.

"Since the establishment by the society of standardized methods and specifications," said Mr. Young, "increasing recognition has been given us as the authoritative body not only in a few,

AT ANNUAL CONVENTION IN LOS ANGELES, MAY 31-JUNE 3

but on all, subjects relating to materials engineering. Such great strides have been made that the society has produced standards covering nearly all of the important materials generally used in engineering construction. These standards, together with those which are now contemplated and are in course of development, will, when completed, afford to the engineer the necessary guides in engineering practices. In the preparation of these standards the fullest co-operation has been obtained from manufacturers and producers, and the standardization thereby effected has enabled the buyer and the seller to speak the same language. In overcoming the prejudice against standardization, the manufacturer has learned that it is possible for him to produce a far better quality of product and at the same time greatly reduce his expenses through mass production. This lower cost makes it possible not only to offer to the public better materials at lower unit prices, but also to maintain higher wages for labor."

Mr. Young advocated the reestablishment of an international association of testing engineers on a basis that will not involve the handicap imposed by the limitations of the original international association that has gone out of existence.

National Research Council Elects Division Chairmen

Announcement is made by the National Research Council of the election of the following division chairmen for the year 1922-23:

Foreign Relations—Robert A. Millikan, California Institute of Technology, Pasadena, Cal.

Educational Relations—Vernon Kellogg, permanent secretary National Research Council.

Research Extension—W. M. Corse, formerly general manager of the Monel Metal Products Corporation, Bayonne, N. J.

Research Information Service—Robert M. Yerkes, National Research Council.

Physical Sciences—Prof. William Duane, Harvard University Medical School.

Engineering—Alfred D. Flinn, secretary Engineering Foundation, New York.

Chemistry and Chemical Technology—Prof. Edward W. Washburn, University of Illinois.

New Orleans Reorganization Approved

The New Orleans Railway & Light Company is to be rechristened the New Orleans Public Service Corporation, and its outstanding capitalization is to be reduced from approximately $70,000,000 to between $45,000,000 and $50,000,000. This is in accordance with the reorganization plans adopted on June 12 by the several committees representing various classes of security holders.

The reorganization plan is the outcome of more than three years of negotiations between the city and the security holders to put the company on a sound financial basis and to improve its service. It represents a final agreement between the different mortgage holders of the company.

Many Water-Power Projects Seek Permits

Pacific Coast, Alaska, Idaho, Pennsylvania, North Carolina and Other Regions Contain Sites Desired—Louisville Has Municipal Scheme

A FIFTY-YEAR license has been granted by the Federal Power Commission to the California-Oregon Power Company for a 100-mile transmission line from Prospect to Springfield, Ore., to form the connecting link between the transmission systems of California and the Pacific Northwest. The line will be constructed for 66,000 volts and changed later to 110,000 volts.

A preliminary permit for one year has been issued by the commission to the Northwestern Electric Company of Portland, Ore., covering a power development on the Lewis River. The Lewis River Hydro-Electric Power Company of Vancouver, Wash., had filed a conflicting application which was denied. The project as presented covers three separate developments on the north fork of the Lewis River, though there is now a market only for the power which would be made available by the lower one. The permit covers this part of the project only.

A preliminary permit for two years has been granted to Joseph B. Leighton of Miles City, Mont., for a project on Yellowstone River at Buffalo Rapids. The applicant proposed to install 15,000 hp. and to use the power for pumping for irrigation and for public utility purposes.

A similar permit, but for power purposes only, has been granted to R. G. McDonald of Williams, Cal., covering a project on Condict Creek in that state. The applicant proposes to use three small lakes as storage reservoirs and to construct two power houses in the canyon below.

To the city of Wrangell, Alaska, a permit covering the development of power on Mill Creek, near that city, has been granted, and to Frank L. Ballaine one covering a project on Kenai River, 50 miles north of Seward, Alaska. J. G. Galvin has received a permit for a project on Aarons Creek, 20 miles southwest of Wrangell.

The city of Louisville, Ky., has applied for a preliminary permit covering a power development at the United States dam in the Ohio River at the Falls of Louisville. The dam and the lock have been recommended for reconstruction. Primary power to the extent of 28,000 hp. would be available at that point, it is estimated. The city plans, however, to install equipment capable of generating 50,000 hp.

Thebo, Starr & Anderton, Inc., of San Francisco have applied for a permit covering a project on the American River, 15 miles northwest of Placerville, Cal., the power to be used for public utility purposes. The primary power available is estimated at 25,000 hp., but it is the intention of the company to install equipment capable of generating 50,000 hp.

The Enterprise Electric Company of Spokane, Wash., has applied for a permit for a project on the east fork of the Allowa River, Oregon. It is expected that 1,200 hp. will be developed.

The construction of a dam near Branson, Mo., across the White River, a navigable stream, is awaiting the approval of the commission. The dam would create a reservoir with an area of 75 square miles, and the object is to increase the power capacity of the Ozark Power & Water Company's project near Forsyth, Mo.

No action will be taken at this time by the commission on applications covering the development of power on Sultan Creek, Washington, because of conflicting applications for these rights. One application has been made by the city of Everett and another by the Sound Power Company. The question will figure in the municipal election next November.

The Northern States Power Company, with offices at 208 South La Salle St., Chicago, has applied for a preliminary permit to cover the construction of a reservoir and three dams on the St. Croix River. This project has been separated from an application made Sept. 20 because it was thought advisable to cover the St. Croix project with an application of its own rather than group it with the Mississippi River development planned by the Northern States Power Company. The primary power available at Kettle Falls on the St. Croix is estimated at 11,000 hp. The company intends to install 27,000 hp.

F. A. Bryan, Indiana & Michigan Electric Company, South Bend, Ind., has applied for a preliminary permit covering a dam and power house on the St. Joseph River, 6 miles above its mouth, in Berrien County, Mich. The primary power is estimated at 800 hp., and it is planned to install 1,000 hp.

The Molybdenum Company of America, 1008 Empire Building, Pittsburgh, has applied for a license covering three dams, conduits and power houses on the Red River and Columbia Creek in Taos County, N. M. The primary power is estimated at 1,000 hp., and 1,350 hp. may be installed. The power is to be used for mining purposes.

The Murtaugh (Idaho) Irrigation District has applied for a preliminary permit to cover a power project which involves the construction of a diversion dam in Snake River just above Auger Falls. A second diversion dam is to be built in Rock Creek from which the water will be carried to the power house 1½ miles distant. The power is to be used for pumping purposes to supply the Hansen-Butte irrigation project.

The Mutual Power Association of Weiser, Idaho, has applied for a preliminary permit to construct a diversion dam in Crane Creek in Washington County, Idaho, and to construct a

canal from that point to a power house 3 miles distant on the same stream. It is the intention to conduct the power by transmission lines to three pumping stations on Snake River. The power is for pumping purposes on irrigation projects.

The Clarion River Power Company, in care of C. B. Hawley, Munsey Building, Washington, D. C., has applied for a preliminary permit covering the erection of a power house on the Clarion River and the building of a dam to a height of 240 ft. at a point 2 miles above the mouth of Mill Creek, near Ridgway, Pa. It is estimated that these works will make available 120,000 hp. of primary power. The plan is to install equipment sufficient to generate 175,000 hp. The power is to be used for public utility purposes.

The Carolina Power & Textile Company, Asheville, N. C., has applied for a preliminary permit to cover five power projects in the Pisgah National Forest, in Henderson and Transylvania Counties, N. C. Three of the projects are on the South Fork of Mills River, one on Rocky Fork of the same river and the fifth on the Davidson River. The application also calls for permission to erect a transmission line to Asheville. Five thousand horsepower of primary power will be developed at the five projects, it is estimated. The intention is to install 10,000 hp. The power is intended for use in the operation of a cotton mill and a brick factory.

The Coming World Power Conference

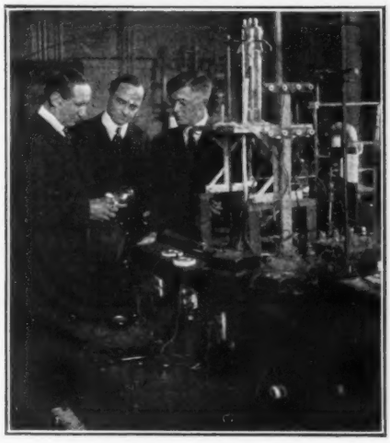
For the projected world power conference to be held in London in 1924, which is being promoted by the British Electrical and Allied Manufacturers' Association in connection with other organizations in Great Britain and other countries, and to which reference was made in the *Electrical World* for April 22, page 795, a preliminary program has been issued, in which the object of the conference is thus stated:

"The purpose of the world power conference will be to consider how the industrial and scientific sources of power may be adjusted nationally and internationally: By considering the potential resources of each country in hydro-electric power, oil and minerals; by comparing experience in the development of scientific agriculture, irrigation and transportation by land, air and water; by conferences of civil, electrical, mechanical, marine and mining engineers, technical experts and authorities on scientific and industrial research; by consultations of the consumers of power and the manufacturers of the instruments of production; by conferences on technical education to review the educational methods in different countries, and to consider means by which existing facilities may be improved; by discussions on the financial and economic aspects of industry, nationally and internationally, and by conferences on the possibility of establishing a permanent world bureau for the collection of data, the preparation of inventories of the world's resources, and the exchange of industrial and scientific information through appointed representatives in the various countries."

It is the intention of the promoters of the conference, of which D. N. Dunlop, British Electrical and Allied Manufacturers' Association, is organizing director, to appoint secretaries, where possible, in the following countries: The British dominions, the United States, France, Germany, Switzerland, Belgium, Italy, Spain, Portugal, Holland, Denmark, Norway, Sweden, Russia, Greece, the central European states, the Near East, Japan, China and the South American and Central American republics.

Marconi Visits Schenectady and Sees Radio Plant

Guglielmo Marconi spent a busy day at the Schenectady plant of the General Electric Company on June 26 inspecting the works and conferring with the wireless experts of the company and of the Radio Corporation of America.



MARCONI TALKS TO AMERICAN SCIENTISTS

The greater part of the distinguished inventor's visit was occupied in inspection of the radio-manufacturing division of the company, its broadcasting station and the research laboratory. The illustration shows Marconi standing with Dr. W. R. Whitney and Dr. Irving Langmuir in the laboratory.

At a luncheon held at the Mohawk Golf Club the toastmaster was E. W. Rice, Jr., and the speakers included Owen D. Young, chairman of the board of directors; Dr. Whitney and Dr. Langmuir.

In responding to a toast in his honor Mr. Marconi spoke of the influence which radio is having and is destined to have on human relations by facilitating communication between the nations of the world. Prediction was made that the encircling of the globe by wireless was a possibility in the not distant future.

Musquash (N. B.) Hydro-Electric Plant Finished

Work on the hydro-electric power station at Musquash, New Brunswick, has just been completed by the provincial government, which has been pursuing a policy of water-power development. Energy from this station will be distributed to cities and towns in southern New Brunswick, including St. John, Fairville, St. George, St. Andrews, St. Stephen and Milltown, as well as Moncton, Sussex and Sackville. A dispute is being waged as to whether the New Brunswick Power Company, which operates the street railway and supplies light and power in St. John, shall distribute the energy in that city or whether the city shall itself do so. This will have to be fought out in the Legislature.

Indications are that the International Paper Company of New York will start work on the hydro-electric station at Grand Falls during the present summer. This company has the water-power privileges at Grand Falls granted by the New Brunswick government on condition that the powers were developed and pulp and paper mills constructed. It is a matter of conjecture what will be the action of the provincial government if the company proceeds with work on the station and abandons the mill project, as it is said it may do on account of labor troubles. There are many cities and towns of small size within easy reach of Grand Falls and on both sides of the international boundary that would be expected to buy hydro-electric energy developed there.

Permanent Water-Power Conference Formed at Asheville

A permanent organization for the study of the water-power resources existing in the southern Appalachian region and their relation to industrial growth and navigation was formed as the result of the first water-power conference for that region, which was held at Asheville, N. C., last week. This organization will embrace Virginia, North and South Carolina, Georgia, Alabama, Florida, Mississippi, Tennessee, Kentucky, West Virginia and the District of Columbia.

O. C. Merrill, executive secretary of the Federal Power Commission, called the conference to order. A survey of what has been accomplished and the vast possibilities awaiting future development of the stream resources of the Southern mountains was made in addresses by N. C. Grover, chief hydraulic engineer of the United States Geological Survey; Col. Joseph Hyde Pratt, director of the North Carolina Geological and Economic Survey; T. W. Norcross, chief engineer United States Forest Service; Col. T. C. Williams, vice-president Columbia Railway & Navigation Company; Prof. C. E. Ferris, dean of the engineering school,

University of Tennessee, and others. Pleas for closer co-operation between states and federal agencies and on the part of private and corporate interests to effect greater conservation as well as utilization of the water-power resources were made.

W. S. Lee, chief engineer of the Southern Power Company, referred to the flood which occurred in the Catawba River valley in the summer of 1916. Had the impounding reservoir which his company has since built at the headwaters of the Catawba River existed at that time, he said, the overflow of the Catawba might have been restrained, saving enormous crop and property damage.

Officers were elected as follows: President, Col. Joseph Hyde Pratt of Chapel Hill, N. C.; vice-president, Lincoln Greene, vice-president Southern Railway Company; secretary, J. A. Switzer; assistant secretary and treasurer, Prof. Thorndyke Saville of the University of North Carolina.

Less Utility Financing During June

During the month of June stocks and bonds amounting to $64,530,000 were offered investors by electric light and power companies. This figure represents a decrease of more than $4,000,000 under the sum reached in May, when the highest figure of the year was recorded. The decrease is not, however, inconsistent with public utility financing of a year ago, when the total dropped from $34,824,000 in May to $19,939,263 in June. The average rate of return yielded the investor declined to 6.22, as compared with 6.74 for the month of May and 6.50 for April.

Special attention is called to the two 5 per cent issues offered at a premium—the Newburyport Gas & Electric Company bonds at a premium of one and a half points and the Turner Falls Power & Electric Company bonds at a premium of three points. The largest single offering was the Tennessee Electric Power Company's issue of $12,150,000.

S. P. E. E. Elects Officers

Prof. Charles F. Scott of Yale University was re-elected president of the Society for the Promotion of Engineering Education at its convention last week held at the University of Illinois, and Prof. D. S. Kimball of Cornell University and Prof. F. G. Higbie of the University of Iowa were elected vice-presidents. M. W. Alexander of the National Industrial Conference Board was elected as a member of the council, an innovation for the society. The other new members of the council, with the universities they represent, are as follows: Edward Bennett, Wisconsin; H. S. Evans, Colorado; E. A. Hitchcock, Ohio; H. T. Hughes, Harvard; C. E. Magnusson, Washington, and G. C. Shaad, Kansas State.

Name of Company	Amount of Issue	Period	Class of Security	Purpose of Issue	Rate of Interest	Offered at	Per Cent Yield
Cincinnati Gas & Electric Co.	$6,000,000	Thirty-nine year	Prior lien and refunding mortgage sinking-fund gold bonds, series B	To be applied to payment of notes falling due and to provide for additional capital expenditures	5½	98½	5.60
Tennessee Electric Power Co.	12,150,000	Twenty-five year	First and refunding mortgage gold bonds, series A	To provide for certain maturing obligations and all floating debt of the properties and to make extensions possible	6	96	6.30
Newburyport Gas & Electric Co. (Mass.)	650,000	Twenty-year...	First mortgage gold bonds, series A	Refunding	5	101½	4.87
Turners Falls Power & Electric Co. (Mass.)	3,000,000	Thirty-year....	First mortgage gold bonds, series A	To retire notes falling due	5	103	4.80
Great Bend Water & Electric Co. (Kansas)	200,000	Five-year.....	Gold notes		8	100	8
Southern Oklahoma Power Co.	1,380,000	Twenty-year...	First and refunding mortgage gold bonds, series A		7	Par	7
Union Public Service Co. (Minn.)	230,000	Fourteen-year..	First mortgage gold bonds	Proceeds will be used to pay off current liabilities and for additions	6	91½	7
Consolidated Gas, Electric Light & Power Co. of Baltimore	10,000,000	Thirty-year....	First refunding mortgage sinking-fund gold bonds, series A		6	99	6.05
West Penn Company	2,500,000	Three-year.....	Gold debentures		6	98	6.75
Scranton Electric Co.	693,000	Fifteen-year....	First and refunding mortgage bonds		5	95	5.50
Public Service Corp. of New Jersey	4,000,000	.....	Cumulative preferred stock	To acquire a substantial controlling interest in other public utility property	8	106	7.50
Newport News & Hampton Railway, Gas & Electric Co.	1,200,000	.....	Cumulative convertible preferred stock		7	93	7
Community Power & Light Co.	500,000	Twenty-year...	First mortgage collateral sinking-fund gold bonds, series A		7½	100	7.50
Manchester Traction, Light & Power Co. (New Hampshire)	2,059,000	Thirty-year....	First refunding mortgage sinking-fund gold bonds	Refunding	5	99½	5.40
Public Service Co. of Northern Illinois	7,000,000	Forty-year.....	First lien and refunding mortgage bonds, series A	To retire maturing obligations, for additions, betterments and new property and to reimburse treasury for capital expenditures	5½	92½	6
Chippewa Power Co. (Wis.)	1,800,000	Twenty-five-year	First mortgage sinking fund gold bonds, series A	To retire present outstanding notes and all other obligations and to provide part of the funds necessary for additions	6	98½	6.12
Vermont & Quebec Power Co.	300,000	Twenty-year...	First mortgage sinking-fund gold bonds		8	100	8
Columbus Electric & Power Co. (Ga.)	1,500,000	Twenty-five-year	First and refunding mortgage gold bonds, series A		6	97	6.25
	2,000,000	.....	Cumulative first preferred stock, series A		7	96½	7.25
Kansas Electric Power Co.	3,000,000	Fifteen-year....	First mortgage series A gold bonds	To refund bonds for the acquisition of properties and for the building of additions, extensions and improvements	6	97	6.30
Twin States Gas & Electric Co.	2,000,000	.....	Prior-lien stock		7	100	7
Toledo Edison Co.	768,000	Twenty five-year	First mortgage gold bonds		5	91	5.68
Danville, Champaign & Decatur Railway & Light Co. (Ill.)	1,000,000	Sixteen-year....	Bonds		5	90	6
Orange County Hydro-Electric Corp. (New York)	600,000	Twenty-year...	First mortgage sinking-fund gold bonds, series A		7	100	7
Total	$64,530,000						

Association's Technical Executive Committee Meets July 12

A meeting of the national technical executive committee of the N. E. L. A. has been called for July 12 and 13 in Madison, Wis. This meeting, headquarters announces, will be of extraordinary importance, the purpose being to work out the details of the plan for making the Technical Section of greater service and of dollars-and-cents value to all member companies through the geographic divisions' organization.

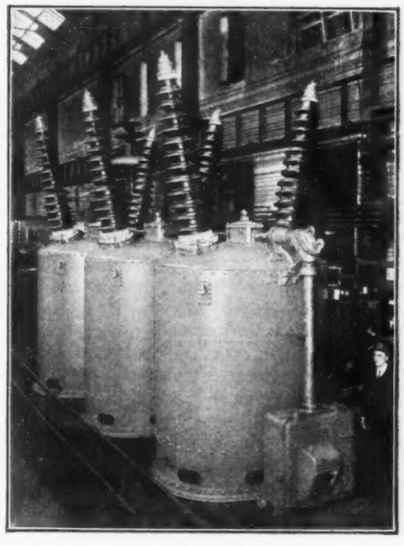
Other News Notes

Harnessing the Jordan.—Concessions for a hydro-electric development on the Jordan River, in Palestine, have been granted by the British government, which holds a mandate giving it control in that country, to Pinhas Rutenberg, a Russian, who is now in the United States endeavoring to raise capital for the project. Especial appeal is made to those back of the Zionist movement, and it is reported that Jewish capitalists in this country have already subscribed nearly a million of the five-million-dollar total needed for the completion of the first part of the development as it is planned. According to the promoters of the plan, the engineering problems involved in harnessing the water power of the Jordan are unique because of the fact that the river, when it falls into the Dead Sea, is 1,290 ft. below sea level. The first stage of the project, however, involves the utilization of the upper waters of the Jordan. The springs of the Jordan start in the watershed of the Hermon range in Palestine. These mountains rise to a height of 4,000 ft. above sea level, so that the total fall of the Jordan is more than 5,200 ft. The river is 140 miles long. Opposition to the concession has been voiced in the British House of Commons based on Mr. Rutenberg's alleged political views. The government has, however, denied that he is a supporter of the Bolshevik régime.

Hoover Asks for Dam to Protect Imperial Valley.—Prompt construction by the federal government of a dam at Boulder Canyon for the protection of Imperial Valley, California, against the flood waters of the Colorado River was urged recently by Secretary Hoover before the House committee on irrigation of arid lands. Mr. Hoover, speaking as chairman of the Colorado River Commission, stated that he earnestly recommended action by Congress upon the project without waiting until the commission could report a comprehensive plan for irrigation and power plants at other places situated along the Colorado River.

Discontinued Telegraph Route from Europe to India to Resume Operation.—It is announced that the Indo-European Telegraph Company's service, which has been completely interrupted since the outbreak of the war in 1914, is to be resumed before long, concessions having been obtained from Germany, Poland and the Soviet government of Russia and progress having been made in the restoration of lines and poles that were destroyed during the hostilities.

Westinghouse Builds Largest High-tension Oil Circuit Breaker.—The Westinghouse Electric & Manufacturing Company has just shipped to the Pacific Gas & Electric Company for its Mount Shasta development what is believed to be the largest high-tension oil circuit breaker ever built. The breakers were built for the 220,000-volt Mount Shasta development and are for use on a 220,000-volt system having a solidly grounded neutral. The breaker is good for a 350-kv. wet test. The gross



shipping weight of the breaker, including oil, is 45 tons. Its net weight, erected on foundation, is 37½ tons. The breaker requires 2,000 gal. of oil for each pole, and exclusive of oil it weighs 15 tons. The height of the breaker from the ground to the top of the bushing is 17 ft. 6¼ in., and its height from the ground to the top of the tank is 9 ft. 8½ in. The long diameter of the tank is 8 ft. while its short diameter is 5 ft. 8 in.

Alaska Cable Will Not Give Way to Wireless.—Replacement of 1,000 miles of the 2,670 miles covered by the Seattle-Sitka cable will be undertaken by the War Department when Congress authorizes an appropriation of $1,500,000 for that purpose. The present cable was laid nineteen years ago and is worn to such an extent that 95 per cent of the current escapes. Officers of the Signal Corps, asked if wireless could not be substituted, said that this could not be done economically or efficiently and maintained that cables will not go out of existence as a result of radio development.

Associations and Societies

Michigan Electric Light Association.—Plans are being made for the annual convention of the Michigan Electric Light Association, to be held at Ottawa Beach, Mich., Aug. 21-23. Much attention is to be given to the subject of rural lines, the coal situation is to be presented from the various angles which concern the utilities, and radio, the organization of central stations for selling appliances, safe and adequate wiring for modern lighting, decorative and domestic service, the relation of the electric utility to the development of the state and public relations will also be subjects of discussion.

Georgia Electrical Association.—With more than 100 delegates, representing every section of the state, in attendance, the Georgia Electrical Association, organized last year in Macon, held its first annual convention in Savannah June 16. The following officers were elected: President, L. W. Roberts, Atlanta; vice-president, P. R. Bomeisler, Waycross; secretary and treasurer, W. C. Drake, Atlanta. Executive committee: Henry Morton, Atlanta; Joel Wier, Athens; Norton Frierson, Savannah; George Shane, Atlanta.

Southwestern N. E. L. A.'s New President.—The secretary of the Southwestern Electrical and Gas Association, E. N. Willis, calls attention to the fact that the new president of the Southwestern Geographic Division of the N. E. L. A. is E. H. Kifer, vice-president and general manager San Antonio Public Service Company, not R. J. Irvine, as stated in the *Electrical World* for May 13. Mr. Irvine was elected, as the item in question correctly noted, president of the Southwestern Electrical and Gas Association. The treasurer of the Southwestern Electrical and Gas Association is F. J. Gannon, not F. G. Ganno, as previously printed.

Coming Meetings of Electrical and Other Technical Societies

Ohio Eectric Light Association—Cedar Point, Ohio, July 11-14. (For program see issue of June 24, page 1290.)

A. I. E. E., Pacific Coast Convention—Vancouver, B. C., Aug. 8-11.

Michigan Electric Light Association—Ottawa Beach, Aug. 21-23.

International Association of Municipal Electricians — New Bedford, Mass., Aug. 22-25.

N. E. L. A. Geographic Divisions—New England, New London, Conn., Sept. 5-7; Rocky Mountain, Glenwood Springs, Col., Sept. 18; Great Lakes, French Lick Springs, Ind., Sept. 28-30.

Association of Iron and Steel Electrical Engineers—Cleveland, Sept. 11-15.

American Electrochemical Society — Montreal, Sept. 21-23.

Illuminating Engineering Society—Boston, Sept. 25-28.

National Association of Railway and Utilities Commissioners—Detroit, Sept. 26.

Telephone Pioneers of America—Cleveland, Sept. 29-30.

Recent Court Decisions

Patents Cannot Be Issued to Land Under Navigable Water.—Dicta on title to riparian lands were laid down by the Court of Appeals of Maryland in Linthicum vs. Shipley as follows: (1) A patent to land under water may not be issued if the water is navigable; (2) a grant by the owner of the bed of a non-navigable stream of land bounding thereon conveys, even without express language, ownership to the middle of the stream; (3) the prima facie presumption is that riparian proprietors of non-navigable streams own the soil covered thereby to the middle of the stream; (4) a boundary on a natural pond or lake, as well as a non-navigable stream, carries title to its center. (116 At. 817.)*

Recovery of Damages from Fire Said to Have Been Due to Central-Station Ash Pile Permitted.—Three plaintiffs (Davenport, Morgan and Hilbert) brought suit for damages against the Intermountain Railway, Light & Power Company to recover for loss caused by a fire alleged to have been communicated from an ash pile negligently kept and maintained by the defendant. The Supreme Court of Nebraska, which affirmed the judgment for the plaintiffs in two of the three suits, declared that it was not erroneous to admit evidence as to the manner of handling the ashes and tending to prove that fire had been seen in the ash pile at various times before the fire which caused the damage and that this condition of the ash pile was continuous. (187 N. W. 905.)

United States Supreme Court's Finding in Interstate Water Appropriation Suit.—In the suit brought by Wyoming against Colorado to determine title to water power on the Laramie River (see issue of June 17, page 1237) the findings of the United States Supreme Court have now become available in their entirety. They cover thirty-four printed pages. On the main points in dispute the court says: "We conclude that Colorado's objections to the doctrine of appropriation as a basis of decision are not well taken, and that it furnishes the only basis which is consonant with the principles of right and equity applicable to such a controversy as this is. The cardinal rule of the doctrine is that priority of appropriation gives superiority of right. Each of these states applies and enforces this rule in her own territory, and it is the one to which intending appropriators naturally would turn for guidance. The principle on which it proceeds is not less applicable to interstate streams and controversies than to others. Both states pronounce the rule just and reasonable as applied to the natural conditions in that region, and to prevent any departure from it the people of both incorporated it into their constitutions. It originated in the customs and usages of the people before either state came into existence, and the courts of both hold that their constitutional provisions are to be taken as recognizing the prior usage rather than as creating a new rule. These considerations persuade us that its application to such a controversy as is here presented cannot be other than eminently just and equitable to all concerned. In suits between appropriators from the same stream, but in different states recognizing the doctrine of appropriation, the question whether rights under such appropriations should be judged by the rule of priority has been considered by several courts, state and federal, and has been uniformly answered in the affirmative. One of the cases came to this court and the judgment below was affirmed. These decisions, although given in suits between individuals, tend strongly to support our conclusion, for they show that by common usage, as also by judicial pronouncement, the rule of priority is regarded in such states as having the same application to a stream flowing from one of them to another that it has to streams wholly within one of them. The contention of Colorado that she as a state rightfully may divert and use, as she may choose, the waters flowing within her boundaries in this interstate stream, regardless of any prejudice that this may work to others having rights in the stream below her boundary, cannot be maintained. The river throughout its course in both states is but a single stream wherein each state has an interest which should be respected by the other. A like contention was set up by Colorado in her answer in Kansas vs. Colorado and was adjudged untenable."

Rebate of Overcharges Ordered.—In passing upon an appeal of the Muskogee Gas & Electric Company against the Oklahoma Corporation Commission because a temporary order of the commission increasing rates had been rescinded and a lower scale imposed, the Supreme Court of Oklahoma sustained the commission in its finding that the rates first allowed, which were in effect from October, 1918, to May, 1919, were more than enough to yield a proper return. The Supreme Court ordered that the difference between the revenue collected by the company since the latter date and the revenue that would have been received under the commission's order should be refunded, the commission to constitute a court of record to determine the amount of rebate and to whom it should be paid. In this case the company held the revised rates to be confiscatory and to have been made without a proper valuation of the company's property. The court found that the company had not asked for a valuation and pointed out that a proceeding could be instituted. (206 Pac. 242.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Taxes as a Factor in Fixing Municipal Rates.—Asserting that municipal utilities which are tax-exempt should turn over to the general fund of the municipality annually a sum of money equivalent to the amount of the exemption, and that it has always given consideration to the question of taxes in every case which has been before it involving rates of municipal plants, the Wisconsin Railroad Commission refused to accede to an application from the city of Kaukauna for a higher rate for the service it supplies to Little Chute than is allowed in Kaukauna, the ground for the application being that the municipality's property in Little Chute is taxed while its property in Kaukauna is not.

Lack of Co-ordination Between Head Office and Local District Agents Criticised.—In a recent survey of the service conditions of the San Joaquin Light & Power Corporation the California Railroad Commission criticised a lack of co-ordination between the head office of the company and its local district agents. This, the commission said, "has not been conducive to the greatest efficiency," and it recommended that the company should "establish the practice of holding meetings monthly at which its district managers will meet and where they may be acquainted and kept in constant touch with the proper application of rules and practices of the company and the policies affecting public relations."

Unremunerative Service.—In a recent hearing upon a petition of the Idaho Power Company to discontinue service on a short rural-line extension, the Idaho Public Utilities Commission said: "A public utility cannot be required to render service unless such rendering will afford a revenue which will pay the operating expenses and taxes, provide proper depreciation reserve and afford a fair return on the investment judiciously made and required in the service of the public. Although this is generally a correct statement of the law, we are not disposed to take the position that each individual class of service afforded by a utility or each particular unit of the system of a utility standing alone shall afford a revenue sufficient to meet its pro rata of the revenue required to pay operating expenses and taxes, provide proper depreciation reserve and afford a fair return, so long as the business of the utility as a whole meets such requirement." This, however, holds true only when a unit or class of service is so interwoven with the system of the utility or general plan of development of the territory served as to be a part of the general system or general development plan.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

Burchard Elected President and Chairman of Board of I. G. E.

Anson W. Burchard, vice-chairman of the board of directors of the General Electric Company, has been elected president and chairman of the board of the International General Electric Company, succeeding Gerard Swope, its former president, who was recently chosen president of the General Electric Company, and Charles Neave, former chairman of the International General Electric Company, who has resigned.

A. W. BURCHARD

Mr. Burchard brings to the presidency of the International company a wide experience in foreign affairs cultivated by personal familiarity with international engineering, commerical and financial problems. He has contributed largely to the development of the manufacturing facilities, financial resources and sales methods of foreign manufacturing and sales agencies in such a way as greatly to stimulate the expansion of the electrical industry abroad.

R. J. Russell, recently elected president of the Electric Power Club, is vice-president and secretary of the Century Electric Company of St. Louis. A detailed sketch of Mr. Russell's activities in the electrical industry will be found in the July 2, 1921, issue of the ELECTRICAL WORLD.

Prof. Jacques Cavalier, rector of the University of Toulouse and a leading authority on metallurgical chemistry, sailed recently from New York for France. Professor Cavalier came to America a year ago as French exchange professor, delivering a series of lectures at the seven co-operative institutions which are making this exchange a permanent arrangement as a part of the general plan to promote closer relations between the engineering professions of France and America.

Stanley A. Dennis Is Editor of "Electrical Retailing"

Stanley A. Dennis, who for four years has been associate editor of *Electrical Merchandising*, has resigned that position and his connection with the McGraw-Hill Company in order to locate in Chicago and develop certain editorial and other work in which he is interested. Mr. Dennis is now the editor of *Electrical Retailing*, published by the Rodger Publishing Company, Chicago. He has also accepted editorial assignments from a few business papers in New York and Chicago. Prompted by his interest and investigations in distribution, especially in the electrical industry, he plans also to assist a number of manufacturers in making extended marketing surveys, and perhaps to develop his own organization of marketing surveyors. To his new work in this economic field and especially to his new responsibilities as editor of *Electrical Retailing* Mr. Dennis carries an extended and specialized knowledge of merchandising problems, gained while he was director of the bureau of business standards of the A. W. Shaw Company, publisher of *System* and *Factory*, and during his four years with *Electrical Merchandising*.

John Fritz Medal Awarded Senator Marconi

The John Fritz medal, one of the highest distinctions bestowed by the engineering profession in this country, has been awarded for 1922 to Guglielmo Marconi. "The medal is awarded to you for the invention of wireless telegraphy," said the communication to Mr. Marconi from the chairman of the Fritz medal board of award. This medal will be formally presented to Marconi at a gathering of engineers from all parts of the country at the Engineering Societies Building, New York City, on Thursday, July 6.

Dr. Arthur E. Kennelly, professor of electrical engineering at Harvard University and the Massachusetts Institute of Technology, who has just finished a successful year as exchange professor to France, has been honored with the cross of the Legion of Honor by the French government.

Prof. Parker Heads Brooklyn Edison Engineering Staff

John C. Parker has been appointed electrical engineer of the Brooklyn Edison Company. Mr. Parker comes to this position after seven years as professor in charge of the department of electrical engineering at the University of Michigan.

Mr. Parker was born in the city of Detroit in 1879 and was graduated from the University of Michigan in 1901. Upon graduation he entered the testing department of the General Electric Company and subsequently occupied the position of instructor in the newly formed electrical engineering school at Union College, Schenectady, N. Y. From Union College he went to Niagara Falls as engineer in charge of the plant of the Ontario Power Company and while in this position he had much to do with the construction of the transmission line of the Niagara, Lockport & Ontario Power Company, as well as in designing and installing the system of receiving stations and substations. In 1907 he became connected with the Rochester (N. Y.) Railway & Light Company as mechanical and electrical engineer, resigning that position in 1915 to become professor of electrical engineering at the University of Michigan.

J. C. PARKER

During Mr. Parker's seven years at that university he spent much time on the development of a general economic theory of engineering design with particular reference to power plants and transmission lines. Mr. Parker is a past-vice-president of the Great Lakes District of the A. I. E. E. and a past-member of the power survey committee of the Great Lakes Section of the N. E. L. A.

Thomas A. Edison was among those honored by Rutgers College, New Brunswick, N. J., at its one hundred and fifty-sixth annual commencement. Mr. Edison was given the degree of bachelor of science.

C. E. Allen, manager of the central-station division of the Chicago office of the Westinghouse Electric & Manufacturing Company, has been appointed manager of the St. Louis office of the company. Mr. Allen entered the employ of the General Electric Company after graduation from the Virginia Polytechnic Institute. After taking the

C. E. ALLEN

apprenticeship course he was transferred to the engineering department, where he was engaged in the design of transformers. In 1909 he became head of the transformer division of the supply department for the Westinghouse Electric & Manufacturing Company. He later was made assistant to the manager of the supply department, and in 1915 was made manager of the supply division of the Chicago office. A short while later he was appointed manager of the central-station division of that office, holding that position until his present promotion.

Charles B. Kendall has been appointed purchasing agent of the Hart Manufacturing Company, Hartford. Conn. Mr. Kendall has been with the company for the greater part of the past eighteen years.

J. W. Hartman has been appointed Southwestern manager for Eccles & Smith, with headquarters in Los Angeles. Mr. Hartman was for many years with the Le Blond Machine Tool Company.

Ira Cushing, formerly of the sales engineering staff of the Condit Electrical Manufacturing Company, Boston, has joined the sales organization of Arthur H. Abbott, New England selling agent for the Bush Electric Company, Electrical Development & Machine Company, Sweitzer & Conrad, Inc., Sundh Electric Company, Ohio Electric & Controller Company and other manufacturers. His headquarters will be at Boston. Mr. Cushing was for some time attached to the Boston office of the General Electric Company and is a past-chairman of the Boston Section of the American Institute of Electrical Engineers.

Gray Jones of the Tubular Woven Fabric Company, who was recently stationed at Pittsburgh, will hereafter have his headquarters at Cincinnati and will take care of southern Ohio, southern Indiana, western Pennsylvania, West Virginia and Kentucky.

C. P. Eldred has resigned the professorship of electrical engineering at Rensselaer Polytechnic Institute and has accepted a position with the John A. Manning Paper Company and the Manning Abrasive Company of Green Island, N. Y.

A. W. Baker has been appointed new-business manager of the Danbury & Bethel Gas & Electric Light Company of Danbury, Conn. Mr. Baker comes to this position after some seven years' service with Henry L. Doherty & Company.

George M. Ogle has become connected with the Public Service Electric Company of New Jersey as electrical engineer. Mr. Ogle comes to this new position after thirteen years of varied experience in public utilities in electrical construction in engineering.

Walter S. Goll has been appointed manager of the Fort Wayne (Ind.) works of the General Electric Company to succeed F. S. Hunting, who recently resigned. Mr. Goll comes to this new executive position after about twenty-five years of activity in the manufacture of electrical apparatus and machinery.

James E. Wilson, for the past six years secretary of the Massachusetts State Association of Electrical Contractors and Dealers, is retiring from this work July 1 and on Aug. 1 will open an office in Boston as a manufacturers' agent. Mr. Wilson is widely known in New England electrical circles. He was identified with the early days of telephone development at Boston, and he served ten years each as field representative of the Pettingell-Andrews Company and of the Stuart-Howland Company of Boston.

Col. N. C. Hoyles has been appointed district manager of the St. Louis sales office of the Pittsburgh Testing Laboratory. Colonel Hoyles is a graduate of Queen's University, Kingston, Ontario, and took a post-graduate course at the University of Toronto. Immediately upon graduation he entered the service of the Pittsburgh Testing Laboratory as inspector at the Birmingham office. In 1912 he was promoted to manager of that office and in 1914 was transferred to the Vancouver office. At the opening of the war he entered the Canadian army, serving with the British Pioneer Engineers Corps in France and receiving decorations from the French and British governments. Upon release from the army in 1919 he was appointed assistant sales manager at Cleveland. Since that time he was in succession assistant sales manager in New York and manager at Cincinnati until his appointment to his new position.

John F. Schurch has been elected a vice-president of Manning, Maxwell & Moore, Inc., in charge of their department of sales, with headquarters at the Chicago office.

W. L. Frost has been recently advanced from the position of assistant to the vice-president to that of manager of the consumers' department of the Southern California Edison Company.

C. D. Adsit has been elected a vice-president of the Georgia Railway & Power Company by the board of directors of that company. This position has been vacant since the resignation some months ago of W. H. Glenn.

Dr. Howard M. Raymond has been elected president of the Armour Institute of Technology. Dr. Raymond comes to this high position in the field of technical education after twenty-seven continuous years as an instructor and professor in the institution of which he is to be the head.

Joseph E. Perkins has been appointed selling agent for the Ward Leonard Electric Company of Mount Vernon, N. Y. Mr. Perkins will cover the territory of Maryland, Virginia and that part of Pennsylvania known as the Susquehanna Valley as far north as Harrisburg and will have his headquarters at Baltimore.

Obituary

Charles F. McGilvray, past-president and recently elected chairman of the board of directors of the Robins & Myers Company, died at his home in Springfield, Ohio, on Tuesday, June 27. He was seventy-three years of age. Mr.

C. F. McGILVRAY

McGilvray had been with the Robbins & Myers Company for many years, and as president he built the company up to a point of eminence in the production of electric fans as well as small motors.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

Summer Lull Advantage to Radio Business

The Basis of Radio Popularity—How a Quiet Summer Will Help Fall and Winter Business

BY WENDELL L. WRIGHT
Stuart-Howland Company, Boston

MANY men right now are disturbed about conditions in the radio business. How serious is the slump to be?—they wonder. Is summer atmospheric interference to prove so serious that people are going to be disgusted with radio? Is it something that the dealer and the jobber and the manufacturer should worry about? We feel that, on the contrary, there is such a distinct advantage in the very presence of the hot-weather lull that every man interested in radio should have it in mind and organize it into his plans.

HOW RADIO APPEALS

In the first place, radio is no fad.

Men of affairs come meekly and with apologetic humility to ask simple technical questions of radio experts. It is surprising to see how many owners of radio sets are interested in the technical side. Shall we attribute it to the boy in every man, welling up from unknown depths, this desire to know "how"? Office boys, clerks, executives, clergymen, street-car conductors, college professors, all are represented. This in itself shows how deeply the roots of radio have penetrated the soil of popular America.

The public has had but a taste, a small sample of what radio is like or what can be done with it. That taste has left a desire for more.

People literally have been forced to read radio news topics. Once shown the way, they have followed largely. Newspapers all over the country are incorporating columns in their daily "forms" about radio which range from rudimentary to highly technical information. Thanks to these newspapers, the public knows in a general way how wireless works. It is safe to assume that the universal interest in radio is not alone in concert reception, but in theoretical operation of the set as well.

Radio today is not quite in a perfect state. Some perplexing scientific and merchandising problems are present. What are we going to do about heterodyning at audio-frequency beat between two regenerative receiving sets? What about satisfactory and cheap elimination of storage and dry batteries and expensive tubes in receiving equipments? How about lower prices on complete equipments? Who is going to pay for broadcasting services? To what type of retail store will retail sales gravitate?

Every radio man knows these and many other problems, but with the best scientific and business minds in the country at work upon these remaining difficulties it will be only a short interval before present-day radio difficulties are ironed out. This we know: Although radio is still in the experimental state, it has reached that point where practicality predominates—that is, where the electrical novice may naïvely enter the field and expect results.

The recent radio boom was too mushroom-like, too rapid, to be for the best interests of both manufacturing and merchandising. Popular radio was like a plant growing in a dark place—very, very delicate. Selling has now slowed down in a satisfactory manner and without artificial retardation. The frail radio plant is out in the sun now and in a fair way to become hardy and strong. Nature herself may be thanked. Balmy, moonlight summer nights are not conducive to wearing head telephones. People are going out of doors. They are going to forget about radio.

Let us, the trade, help them forget.

THEY COME BACK STRONG

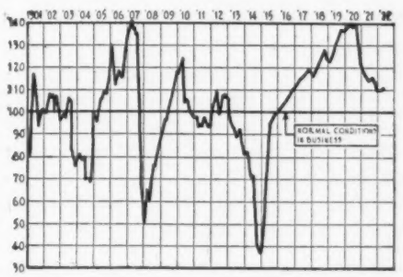
One of the peculiar kinks in the make-up of men is that of recurring mania. You are widely interested in a thing. Forget it for three months, then become interested in it again, and your interest is many times stronger than it would have been had you had no interval of forgetfulness. Why should we not apply this characteristic to radio sales?

The summer lull is introducing a period of forgetfulness. For three months radio will fill few thoughts. Then, in the fall after the evenings are chilly and the cold settles down, our radio man will wake with a start.

As every one knows who has seen the "radio bug" bite, the injected serum is powerful stuff. The inoculated one must have a radio set at once, no matter what or how. Last season our novice had already started the long climb, rung by rung, up the ladder toward the best set. Then summer came. He relinquished his attacks upon the vibrating ether while golf, seashore and mountains claimed his time. With the beginning of long evenings he will come back to radio just as sure as a carrier pigeon comes home. He will hunt around and dig up the old set, dust it off and try it out. Faults which before were overlooked will stand out as prominently as sore thumbs. He will scarcely be satisfied to come back into the game with his old equipment.

This coming fall will see an

Trend of Business Cycles



HERE is a picture of the business cycle as it has afflicted this country through the past years. The question is, How much can each unit of industry contribute cooperatively to neutralize these influences?

enormous amount of radio business done. There will be no scarcity of supplies, no scrambled deliveries, no long delays and cancellations. For the various manufacturers ought to catch up on their orders by September. When the business done this year far exceeds last season's there will be less talk about it, simply because there will be no shortage over which to tear one's hair. We are looking forward to an unprecedented radio activity beginning in September. It will be a prosperity built not upon the shifting sands of popular fads and fancies, but rather extending its foundations down to the bedrock of solid, substantial manufacturing and merchandising principles.

Chain Stores—Their Growth and Significance*

BY DR. PAUL H. NYSTRON
Director Retail Research Association, New York City

THE chain-store system of distribution is a normal development of the evolution of business. Department stores and mail-order houses began to appear simultaneously about sixty or sixty-five years ago. Chain stores came soon after. The department stores resulted naturally in large cities from the development of modern advertising methods, rapid transit and the use of telephones. Mail-order houses resulted from rapid spread of population over great areas with which ordinary methods of distribution could not keep up and from the use of modern advertising methods, and they were coincident with the development of easy and safe means of transportation and the improvement of the mail service, rural free delivery and so on. Chain systems followed the tendency that has been dominant in nearly all lines in the last fifty years toward concentration and consolidation of enterprise.

The department store consolidates ownership and management of many lines of merchandise under one roof. The chain store consolidates the ownership and management of many units within the same line of merchandise, with decentralized location.

HOW MUCH THEY SELL

Grocery chains, including tea and coffee retail distributors, were the first in the field. During the eighties and nineties the five- and ten-cent stores, together with their prototypes, the "ninety-nine-cent stores" and the "racket stores" and "novelty stores," came into existence. Since 1900 the chain-store idea has spread to a great variety of lines, including tobacco products, confectionery, drugs, haberdashery, clothing, dry goods, automobile supplies, restaurants, bakeries and barber shops. There are now probably more than 2,000 chain-store systems in existence in this country, with a total of over 100,000 retail outlets. Probably more than 5 per cent of all goods sold to consumers in this country pass through chain stores.

One of the principal points of competition between chain stores and independent stores is the competition of management between chain-store experts operating indirectly through assistants and the independent store managers who operate directly and in personal contact with their businesses. That some independent store managers are outdistanced in this race is not surprising when one considers the lack of training many of them have when entering the business. Many independent store managers are quite content under the stress of such competition to sell out or give in to the chain and become lieutenants or rank and file men under the direction of the chain-store experts. On the other hand, the chain store sometimes meets defeat. I have heard chain-store executives say, "I never locate a store in a community in which there is a live independent dealer," and "Sometimes we make a mistake and get into a community where there is a live merchant or where one who formerly was more or less dormant began to adopt up-to-date merchandising methods on our arrival. When we discover it we pull up our store and sell our lease."

That neither the chain-store nor the independent-store management has a monopoly of the best methods of management is sufficiently proved. The profits go to the better managers whether they are in chain stores or independently owned stores. When we come to buying, however, the chain stores seem to enjoy a decided advantage over most independent stores because of their power to buy in large quantities.

The reasons for a lower price to a purchaser of larger quantities is well known. Producers' sales costs are reduced or entirely eliminated in such sales. On large orders of a single item production can be standardized, most economical machine processes can be introduced, and manufacturing costs are thereby cut down. The manufacturer with such large orders in his possession can in turn frequently procure raw materials at a substantial reduction, further reducing the costs of manufacturing. The elements of speculation for the producer are largely eliminated, and the necessary margin to cover insurance against market losses may be omitted.

Buying advantages are almost certain to be equalized between the chain stores and the independent retailers through the gradual development of associated effort among the independent retailers themselves. Such co-operative associations grow slowly. Independent retailers, in common with all other masses of people, learn by degrees and costly experience. One reason why chain stores have been successful in the immediate past is because the independent retailers have been so slow in getting together for mutual interest. But the reaction is soon to come.

HERE TO STAY

Chain-store systems are here to stay undoubtedly. They came into existence because there was a definite field of service for them not adequately covered by any other type of retail institution. Most of the chains have made their successes by offering a more limited type of service than is given by most independent retailers, and also by specialization in merchandise. The chain organizations, by reason of the necessities of their organization, have developed certain phases of retail distribution to a very high degree of efficiency and have thereby taught important lessons to all store managers of all classes of stores, for example: more complete and more intelligent retail accounting, better methods of arrangement and display of merchandise, and the value of securing the best possible locations. Finally, the chain stores have taught the retailers the great lesson of getting together in buying.

*A recent address before the Chamber of Commerce of the United States.

Review Shows Business Progress

Brief Paragraphs and Three-Year Curves Indicate Prevailing Conditions that Affect Cost and Volume in the Electrical Industry

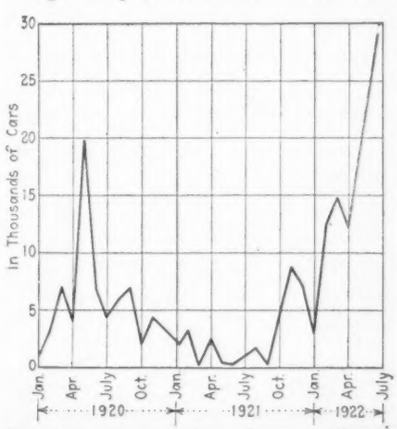
Revival in business is getting on more substantial grounds, figures received by the Department of Commerce up to June 20 indicate. Among favorable features may be mentioned sustained activity in the building industry, marked increase in production of automobiles and trucks, lower interest rates and increasing demand for money, increase in employment, and decline in business failures.

DEBITS TO INDIVIDUAL ACCOUNTS MEASURE GENERAL BUSINESS ACTIVITY WHEN COMPARED WITH PIG IRON PRODUCTION

Debits to Individual Accounts.—A large corporation recently requested a good curve showing general business activity, against which its own business might be plotted. Bank clearings were the first thought, but still better is the aggregate of checks drawn by individuals on their bank accounts. This new barometer is published for the benefit of electrical manufacturers who may wish to check their activities against the swing of general business.

Gasoline production in April, the latest figures available, amounted to 472,920,000 gal. and sets another new high record. Stocks of gasoline also increased nearly 40,000,000 gal. in April, thus breaking the high records established in each of the two preceding months. Stocks are now nearly 100,000,000 gal. greater than any record made before the first of this year.

Pig-iron production continued to increase in May, with a total of 2,306,679 tons, or 234,565 tons more than in April. This figure is still below the 1913 monthly average, but is the largest output for any month since January, 1921.



RAILROAD FREIGHT-CAR ORDERS.—FIGURES COMPILED BY "IRON TRADE REVIEW"

Steel ingot production in May, computed to 100 per cent of the industry, amounted to 3,099,155 tons, or about 300,000 tons greater than in April. Unfilled orders of the United States Steel Corporation at the end of May totaled 5,254,228 tons, or 157,000 tons more than the month before.

Hollow-ware sales in the St. Louis district, while showing some increase over previous months, are about normal for this time of the year. As wedding presents, percolators are favorites. Curling irons are above average demand because of the prevailing mode in hairdressing. Flatirons are meeting a very popular demand, and sales are reported to be 10 to 25 per cent greater than a year ago. In the Portland (Ore.) district demand for hollow ware is somewhat slow. It is appreciably better than for the same period of May this year, but shows very little improvement over June, 1921.

Consumption of cotton increased in May, compared with low figures in April, but the total of 495,674 bales is still below the consumption in the closing months of 1921 or in January and March of the present year. Exports of cotton in May totaled 469,397 bales, compared with the high April figure of 612,659 bales.

Continuation of the coal strike, with no immediate prospect of settlement, constitutes an unfavorable feature which has so far seemed to cause little uneasiness. Stocks of coal are ample, although demands caused by greater industrial activities are using them up at a more rapid rate.

Coal production in May remained near the low level set in April, with a total output of bituminous of 20,506,000 tons. Outside of a little river dredging of steam coal there was no anthracite production. The production of by-product coke increased 330,000 tons, compared with April, while beehive coke production again declined.

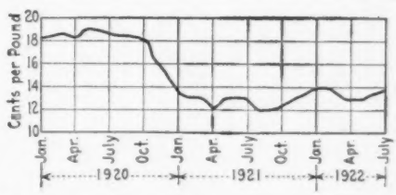
Wholesale prices of bituminous coal increased during May, as did price of coke. There were no quotations on anthracite coal reported by the Bureau of Labor Statistics. Retail prices of all coal remained practically stationary, with slight recessions from the April figure.

Suspension of anthracite mines since April 1 has cost Pennsylvania operators $52,780,000 and the miners $41,979,600, Clifford B. Connelley, Pennsylvania State Commissioner of Labor and Industry, declared in an address before the Scranton Rotary Club last week.

Production of kerosene increased slightly in April, but the output of gas and fuel oil, as well as of lubricating oil, declined. Stocks of all three products increased slightly.

Zinc output and movement in May showed a larger volume than for many months past. The same was true of receipts and shipments of lead. Prices of both metals increased compared with a month ago.

New York Stock Exchange activity continued to be marked during May, although the total sales of both stocks and bonds were less than in April. Prices of all classes of securities continued to advance. Debits to individual accounts in New York City increased but outside debits were less than in April.

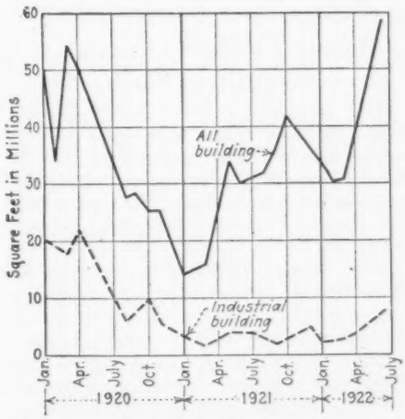


PRICES OF ELECTROLYTIC COPPER DELIVERED —FIGURES COMPILED BY "DAILY METAL TRADE"

Cost of living on May 15, 1922, was 54.9 per cent above that in July, 1914, studies by the National Industrial Conference Board show. Between April and May, 1922, the cost of living rose one-tenth of 1 per cent. As compared with July, 1914, food prices are 30 per cent, clothing 56 per cent, rent 65 per cent, fuel and light 74 per cent and sundries 74 per cent higher.

Ten thousand civilian employees in navy yards and stations will be laid off without pay early in July, 1922, to meet restricted appropriations.

Production of most building materials, so far as reported, also increased in May. This was particularly true of cement. The May output amounted to 11,176,000 barrels and shipments totaled 12,897,000 barrels, thus establishing new high records in this industry.



MONTHLY CONSTRUCTION SHOWING ALL BUILDING AND INDUSTRIAL BUILDING. —FIGURES COMPILED BY F. W. DODGE CO.

Revenue Freight Loadings Near 1922 Record

Loading of revenue freight during the week ended June 10 totaled 846,002 cars, compared with 750,645 cars during the previous week, or an increase of 95,357 cars, according to reports received from the railroads of the United States by the American Railway Association. This increase was largely due to the fact that the previous week included a holiday. There was an increase, however, of 24,871 cars compared with the week before the holiday. The loading for the week of June 10 also came within thirty-five cars of the largest loading for any week this year preceding the coal strike.

WEEKLY CAR LOADINGS

Week ended	1922	1921	1920
June 10	846,002	787,283	930,283
June 3	750,645	693,903	828,907
May 27	821,121	795,335	898,169
May 20	792,459	770,991	862,074
May 13	777,359	751,186	843,145
May 6	755,749	789,776	843,184
April 29	758,286	721,084	800,900
April 22	714,088	704,632	717,777
April 15	706,713	702,116	601,695
April 8	714,268	694,881	801,559
April 1	827,011	663,171	858,827
March 25	846,035	686,567	895,386
March 18	823,369	691,396	855,060
March 11	829,128	700,440	819,329
March 4	803,255	711,367	811,106
February 25	735,286	659,242	783,295
February 18	780,924	692,007	772,102
February 11	788,412	687,867	786,633
February 4	753,886	699,718	762,680
January 28	743,728	701,605	803,332
January 21	738,275	708,658	804,866

Compared with the corresponding week last year, there was an increase of 58,719 cars, but compared with the corresponding week in 1920 the total for the week of June 10 represented a decrease of 84,974 cars. Increases compared with the corresponding period last year were shown in the loading of all commodities except grain and grain products and coal. Merchandise and miscellaneous freight, which includes manufactured products, totaled 563,640 cars, an increase of 93,988 cars compared with the corresponding week last year, and 35,702 cars more than the corresponding week two years ago. Comparisons by weeks since January for three years are given in the accompanying table.

Business Failures Decreased Slightly in Week

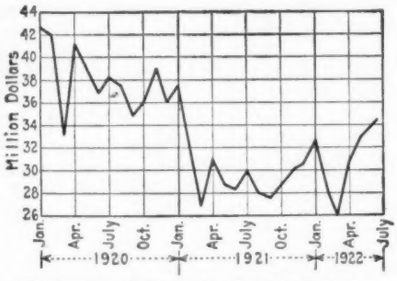
The decrease in the number of business failures continued last week, when 391 defaults were reported to R. G. Dun & Company, as compared with 407 a week ago. The figure for the corresponding week a year ago was only 276.

Last week's figure for insolvencies involving $5,000 or over in each instance shows, however, a continuation of the increase in the ratio of such failures to the total. Last week's figure is 227 and the percentage 58, compared with 231 and a percentage of 56.7 the week before and 55.2 per cent the week before that. A year ago the number of similar failures was 137, being 46 per cent of the total.

Canadian failures also show a decrease, fifty-eight being reported this week, compared with sixty-one last week. A year ago the figure was thirty-nine. Of defaults with liabilities of $5,000 or more in each case, twenty-four were reported this week. A week ago there were thirty.

Bank Clearings Show Large Gains Over 1921

An enlarged volume of bank clearings is noted this week, an aggregate of $7,170,780,000 at twenty cities in the United States, as reported to *Dun's Review*, representing an increase of 22.2 per cent over the $5,866,267,177 of a year ago. Last week there was a gain of 9.0 per cent over last year's figures, and the reduction this week from the total for 1920 is 6.4 per cent, against a decrease of 11.9 per cent last week. Excepting Cleveland, Minneapolis and Kansas City, where small losses appear, this week's clearings at points outside of New York which are included in the statement show increases in every instance, and the aggregate for the outside centers—$2,533,580,000—is 18.3 per cent in excess of that of a year ago.



BANK CLEARINGS FOR THREE YEARS.—FIGURES COMPILED BY "FINANCIAL AND COMMERCIAL CHRONICLE"

Large Transformers Are in Good Demand

Sales of transformers in the larger sizes have been improving greatly during the past few months, and one manufacturer stated recently that his orders in the first half of 1922 surpassed in total rating those for any other corresponding six months in the company's history. The demand for transformers has centered chiefly in units for important power transmission projects here and abroad, and in one plant with which a representative of the *Electrical World* was in touch last week it was stated that the average unit sold in the first half of this year was rated at 4,000 kva. This has been accompanied by a much appreciated reduction in labor cost per unit of output.

Overseas transformer business has been booked from both France and Japan, and interest abroad in hydroelectric development is active. There seems to be little if any difficulty at present voiced by manufacturers as to the supply of material for transformer construction. Labor is paying more attention to efficiency in production, and as business increases the more skilled employees are being taken back and employed for longer hours in the factories where it had been necessary to lay off a portion of the force or to run on part time.

Interest in very high-voltage transformers is widespread among the larger power companies, and manufacturers are now prepared to supply apparatus to meet much severer conditions than hitherto. Distribution transformers are moving less rapidly in proportion to the total market, but the expansion of the building industry in various parts of the country is having some effect on demand.

New England Collections Tighten Slightly

Collections in New England are slower than last month, though nothing disquieting is apparent in jobbing circles. Open accounts are being closed in sixty to ninety days with the former limit predominating. Bill discounting is being done by some of the larger central-stations, contractor-dealers and industrial plants. Railroad payments for electrical material are coming in better. The contractor-dealer accounts are being watched very closely in districts where industrial plant strikes are hampering trade, and new accounts are being sharply scrutinized.

Metal Market Situation

Copper prices are firm with sales comparatively small both in the domestic and foreign market. A moderate amount of metal has been sold at 13⅞ cents delivered for August, but current price is somewhat lower from both second hands and some of the producers. Little improvement in buying is expected until the new freight rates are announced and until it becomes more certain as to whether or not there will be a railroad strike. Foreign buying appears to be awaiting a better indication of the trend of European affairs.

NEW YORK METAL MARKET PRICES

	June 21, 1922	June 28, 1922
Copper		
London, standard spot	£ s. d. 63 2 6	£ s. d. 63 2 6
	Cents per Pound	Cents per Pound
Prime Lake	14.00	14.00
Electrolytic	13.62½	13.62½
Casting	13.37½	13.25
Lead, Am. S. & R. price	5.55	5.55
Antimony	5.05	5.00
Nickel, ingot	36.00	36.00
Zinc, spot	5.70	5.62½
Tin, straits	31.37½	31.12½
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	11.00–11.50	11.00–11.50
Brass, heavy	5.50– 5.75	5.50– 5.75
Brass, light	5.00– 5.12½	4.87½–5.00
Lead, heavy	4.62½–4.70	4.62½–4.70
Zinc, old scrap	3.00– 3.12½	3.00– 3.12½

The Week in Trade

Prices When Quoted Are Those Reported at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

REPORTS from all over the country say the electrical market is steady with few price changes. Wiring demand is normal and from the present outlook should hold up well throughout the summer. Quotations for wire are holding steady, although some price cutting has been reported. Demand for industrial and residential meters is well maintained, though little increased demand is to be noted. Telephone equipment stocks are becoming low as a result of recent heavy movements in all items. Jobbers handling farm-lighting apparatus report increased activity due to improved conditions in rural districts.

New York

Demands Are Reported Steady With Prices Firm—Lower Quotations for Soldering Irons

Demand for wiring supplies is fairly steady and from the present outlook, should hold up well throughout the summer. Quotations are holding steady, although some price cutting has been reported. Effective July 1, two of the leading heating-appliance manufacturers have announced a revision of their schedule of prices, but these, for the most part, do not amount to more than 25 cents on each appliance. Prices on industrial soldering irons have been lowered from $1.50 to $3.

Rigid Conduit. — Conditions and prices show no change. The following prices are quoted this week: For ½-in. black pipe in 2,500-ft. lots, $44.50 to $46.58; ¾-in., $58.10 to $59.57, and 1-in., $82.79 to $84.66 per 1,000 ft. Quotations on galvanized pipe in the same sizes and quantities were $50 to $51.68, $64.50 to $66.47 and $92.20 to $94.86 per 1,000 ft.

Rubber-Covered Wire.—Quotations are holding firm, but there is a general belief that prices will be higher. No. 14, single-braid, rubber-covered, sells for $6.20 to $6.50 per 1,000 ft. in 5,000-ft. lots.

Flexible Armored Conductor.—Demand is steady and sales are in moderate size quantities. No. 14, two-wire, single-strip, is quoted at $43 per 1,000 ft. and double-strip at $45 per 1,000 ft., both in that quantity.

Sockets.—In standard-package lots, pull sockets are at 33 cents, key sockets at 18 cents and keyless at 16 cents each. Demand is active, but there is some price competition.

Metal Molding.—In 5,000-ft. lots the three-wire size is quoted at $4 per 100 ft. For quantities of 1,000 ft. or less the price is $4.30 per 100 ft.

Fans.—Sales are easing off. Jobbers are well satisfied with volume of business.

Heating Appliances.—Two of the leading manufacturers of domestic heating devices have announced a revision of prices effective July 1.

Flashlamps.—Increased sales are reported.

Chicago

Wire Prices Stiffen—Conduit Stocks Are Lower—Active Pole Business—Fans Are Slow

Business in the electrical market, while sustaining its past record, is just holding its own in this district. No pronounced change can be noticed, although prices on wiring materials are gradually stiffening. Some dealers state stocks of conduit are running low and report that manufacturers are running behind in shipments. The pole industry has been moving steadily with few changes, although a slight revision of freight rates on July 1 may alter prices.

Wire.—Demand for rubber-covered wire is still steady and prices are unchanged. No. 14 sells between $6.15 and $6.25 per 1,000 ft. in 5,000-ft. lots. Few variations in the price of bare and weatherproof wire were noticed, but it ranged from 16½ to 17 cents a pound.

Flexible Armored Conductor.—Jobbers report few changes in the call for armored conductor, and the price is $42.50 per 1,000-ft. for No. 14, two-wire, single-strip, in 5,000-ft. lots. Stocks are in fair condition.

Conduit.—Prices are steady. The ½-in. black pipe is quoted at $43 per 1,000 ft. in 5,000-ft. lots.

High-Tension Equipment.—One company received orders for a 44,000-volt, 1,500-kva., steel-tower substation for New York State and a 33,000-volt, 900-kva. substation for the Middle West. A good volume of business on farm-line equipment is reported.

Poles. — Extensions and replacements on the part of public utilities are the biggest features of the pole business. Prices are unaltered. The 7-in.-top, 30-ft. Western red cedar sells for $7.80 f.o.b. Chicago, while the same size in the northern white cedar is quoted at $8.40 f.o.b. Chicago.

Pole-Line Hardware. — The movement of this equipment is induced by a fair call for poles. Prices are firm and stocks ample.

Cross-Arms.—Few changes in the cross-arm market occurred during the past month.

Boston

Loom Sales Dull—Fixtures Are Active—Inquiries for Electrical Trucks Reported Increasing

Electrical supply jobbers are very active along wiring material lines. Deliveries of rigid conduit are being maintained with some difficulty. Appliance sales are rather spotty. It is announced that a million dollars will be expended soon in new residence construction in the Arlington suburban district. Financial conditions are stronger in this territory and preparations among electrical manufacturers are active for a vigorous fall business. Employment is increasing widely.

Rigid Conduit.—Deliveries are barely meeting requirements. Building operations are absorbing large quantities of this material, chiefly in the smaller sizes. Fittings are in plentiful supply. Prices are steady, ½-in. black in 500-lb. to 5,000-lb. lots selling at $51.89 per 1,000 ft. and the same size in galvanized at $56.99.

Flexible Armored Conductor.—Sales continue brisk, with satisfactory deliveries as related to present demand. Prices range from $44.20 per 1,000 ft. in 5,000-ft. lots to $41 in 25,000-ft. orders.

Loom.—Local sales are rather dull, barring a fair demand from Maine, which is a large user of this material. Prices are quiet, the 5,000-ft. lot quotations Monday being $14.75 per 1,000 ft. on 7/32-in. and $17 on ¼-in. Deliveries are easy.

Tape.—Increased wiring work is causing the movement of moderate quantities of tape, the current price ranging from 35 to 40 cents per pound in 100-lb. lots, according to quality.

Wire.—Considerable activity is apparent in rubber-covered and weatherproof wire, but sales of bare copper wire are dull. No. 14 rubber-covered sold Monday at $6 to $6.25 per 1,000 ft. in 5,000-ft. lots. Triple-braid weatherproof sold Monday on the basis of 18.5 cents per pound in 200-lb. lots and over, sizes No. 4/0 to No. 8 slow-burning wire being quoted at $19 per 100 lb.

Starting and Lighting Sets.—Business has improved materially during the past month or two. A leading manufacturer reports the largest May earnings in his history, with good prospects for summer. Automobile headlamps are moving well.

Industrial Electric Trucks.—Light sales feature the market, but inquiries are increasing, and some replacement business, either of complete units or repair parts, is being booked. Prices are steady for both trucks and batteries.

Fixtures.—Sales for residential and office building service are very active, and mercantile installations are absorbing considerable modern lighting material. Industrial requirements are not so much in evidence.

Atlanta

Meter Sales Are Holding Well—Farm-Lighting Outfits Are in Greater Demand

A number of transmission lines are being projected in new territory, and this in turn will stimulate the sales of transmission-line material, as well as distribution material for low-tension systems.

Up to date no shutdown of plants or curtailment of operations has been felt as a result of the coal strike, and little uneasiness is expressed in regard to the outlook. The threatened rail strike is looked upon as more serious, but so far nothing has developed to cause any definite reaction among manufacturing interests.

White-Way Lighting Equipment.—More interest than for some time past is being displayed by municipalities. All jobbers report an increasing number of inquiries, though few orders have materialized to date.

Meters.—Sales in this line are holding up well, particularly in the 5-amp. and 10-amp. sizes, though little increased activity is to be noted. Stocks are ample to meet all demands.

Telephone Equipment. — Jobbers handling this line of material report a good movement in all items, with the result that stocks are rather low.

Exhaust Fans.—The movement in this item has not showed up as well as was expected, though a fair activity is reported in 22-in. to 30-in. sizes.

High-Tension Transformers. —Several large power companies in this section are planning high-tension line extensions which will tend to increase very materially the volume of sales in this line. Local stocks in the popular sizes are satisfactory.

Farm-lighting Outfits. — Jobbers handling this specialty report an increased activity due to improved conditions in the rural districts.

Conduit.—All jobbers report an excellent movement in this line in practically all sizes, both black and galvanized and stocks are rather low.

Armored Conductor.—This line is showing a very brisk movement, and stocks have fallen to a low ebb. Present quotations for No. 14, two-wire, in lots of 5,000 ft., are $51.80 per 1,000 ft.

St. Louis

Flatirons and Vacuum Cleaners Active—More Calls for Porcelain—Fuse Market Improving

Business has been active here this week, though it was not up to the level of last week. Warm weather and vacations are resulting in a seasonal slackening. Fan business is not quite so active, but a good volume is being maintained. Flatirons, washing machines and vacuum cleaners are good sellers, and wiring business is particularly strong.

Fans.—Cooler weather has caused fan sales to slacken.

Flatirons.—One dealer is conducting a special-offer campaign and selling in exceptionally good volume. Stocks are in excellent condition.

Porcelain.—Demand is more active. Representative prices are: "Nail-it" knobs, $15 per 1,000; $\frac{5}{16}$-in. x 2$\frac{1}{2}$-in. tubes, $3.73 per 1,000; $\frac{5}{16}$-in. x 3-in. tubes, $4.50 per 1,000; split knobs, $10.70 per 1,000; unglazed cleats, $10.70 per 1,000—all in barrel lots.

Fuses. — Considerable improvement, due chiefly to better demand from the industrials, is noted. Non-renewable cartridge fuses, 250-volt, in standard package lots, are priced as follows: 0-amp. to 30-amp., $4.60 per 100; 35-amp. to 60-amp., $6.90; 65-amp. to 100-amp., $20.70; 110-amp. to 200-amp., $46; 225-amp. to 400-amp., $82.80; 450-amp. to 600-amp., $126.50.

Wire.—Sales have been quite active this week, especially in No. 14 rubber-covered. Larger sizes of rubber-covered are beginning to move in something like satisfactory volume. Weatherproof purchases by the utilities remain strong. Representative prices are: No. 14 rubber-covered, $6.25 to $6.50 per 1,000 ft.; No. 10 rubber-covered, $12.50 to $12.90 per 1,000 ft.; No. 6 weatherproof, 16 cents per pound for 500 lb. or more; base on bare, 17 cents per pound. Stocks are still sufficient to meet requirements.

Portland–Seattle

Conditions Improving—Washing Machines and Vacuum Cleaners Moving in Fair Volume

Business conditions continue to improve. Stocks and bonds show an appreciable decline in demand. Real estate is suffering a decline at the present time, although building activities continue at a rate well in excess of the same period last year.

There is now under construction or ready for immediate construction in Portland well over $3,000,000 worth of large projects.

Seattle's water-borne commerce for the first five months of 1922 shows an increase of 28.5 per cent over the same period of last year. Lumber production continues to exceed normal and is still somewhat under new business. A reduction in freight rates effective July 1 will undoubtedly have some effect on business, although it is not expected that it will be reflected in prices except in the case of large orders, such as carload lots of wire conduit or appliances.

Contractor-dealers are enjoying a business which continues to gain from week to week. Fixture business is very active. Few if any skilled electricians are now unemployed. Electrical jobbers report business good. Prices are stable, although in some lines a tendency to stiffen is apparent.

Ironers.—The demand for ironers is weak at the present time.

Household Appliances.—The movement is good, and the demand for percolators, grills and irons is particularly strong.

Ranges.—The demand for electric ranges continues to be very good.

San Francisco

Weatherproof Wire Advances 50 Cents—Summer Business in Lamps Holds Well

Business from power companies continues very good. Collections are better, although still running around fifty days. Credits are easier. There is very little unemployment reported, for even unskilled labor is required just now for fruit and agricultural ranchers and packers. The threatened railroad strike has not appreciably increased the amount of westbound freight. It seems to be the general belief that this strike will not materialize. Lower freight rates recently announced will be very welcome to rail shippers, although a larger proportion of boat shipments is in evidence.

Weatherproof Wire.—Increase of 50 cents per 100 lb. is announced. The present schedule for coils of three-braid solid-base sizes is $21.50 per 100 lb. Local stocks are in good shape.

Switches.—Present prices on push switches are as follows: Commercial-grade push switches, single-pole, $17.75 per 100, and three-pole, $25.25. Local stocks are good and the demand very steady in hundred lots and in hundred gang lots.

Lamps.—Summer business holds up well. The larger amount of private building has helped to increase dealers' contracts, and the reopening and preparation of packing plants for the season has affected the interior accounts.

Salt Lake City–Denver

Electric Iron Dealers Well Stocked and Find Market Responsive to Intensive Sales Efforts

Steady improvement in general business conditions is reported from every part of the Intermountain region. Although recovery here lags slightly behind the return to normal in the East, there are sure indications of better times. May showed a remarkable increase in the sale of electrical merchandise.

In the electrical market the country districts have a considerable lead over the larger cities, according to jobbers' records. More merchandise of various kinds is being sold to rural families than to city families.

Electric Irons.—Increase in sales week by week is satisfactory. Dealers are well stocked and are finding the market responsive to intensive sales efforts. Several inferior brands have recently come on the market but are making no headway against the standard products. Six-pound irons, selling in the neighborhood of $5, are moving readily.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

New Security Issue for Tenney Companies

New preferred stock of the issue value of $1,535,100 at $85 per share is being offered stockholders of the North Boston Lighting Properties for the purpose of paying for 4,761 shares of Malden Electric Company stock and 6,179 shares of Malden & Melrose Gas Light Company stock, and also to retire $300,000 four-year 6 per cent notes of the North Boston Company maturing Dec. 15. Stockholders have the right to subscribe for one new share for every six shares of either common or preferred stock now held, the rights expiring July 5. The new issue will bring the North Boston capitalization to 87,704 shares of preferred and 30,376 shares of common stock. Upon completion of this financing the company will have no bonded debt. The company is a voluntary association owning or controlling the Malden Electric Company, Malden & Melrose Gas Light Company, Suburban Gas & Electric Company, Salem Electric Lighting Company and Eastern Massachusetts Electric Company, which operates the inter-utility transmission tie-line system between Salem, Malden, Revere and other points connecting with the Boston Edison system. These properties are managed by Charles H. Tenney & Company of Boston.

Stresses the Need of Greater Residential Construction

Despite the increased building activity in the United States during the last six months, the housing shortage for the country as a whole has been estimated as somewhat more than two and a half years' production by John Ihlder, manager of the civic development department of the Chamber of Commerce of the United States, speaking before the National Conference of Social Work.

According to Mr. Ihlder, the situation is not the same in all American cities. In some cities the shortage is estimated as nearly four years' production, he said, while in others it is approximately one and a half years, or even less.

"This means," he explained, "that many thousands of American families are still living in cramped quarters, well-to-do as well as poor. More significant, it means that a considerable proportion of these families are becoming accustomed to this cramped living, accepting it as normal. I have heard of an admiral of our navy who, with his wife and two sisters, occupies three rooms in an expensive apartment house and has his meals prepared on an ingenious little electric stove in the hall and of a comparatively well-to-do woman who occupies one room and bath and has her clothes washed in the bathroom. When one goes from such people to the poor, he finds the old overcrowding accentuated and unsanitary conditions worse than they were before the war."

Chicago Lamp Shade Company in New Location

The Model Lamp & Shade Company has moved from 1104 South Wabash Avenue, Chicago, to 736 Tilden Street. T. P. Weinstein, the president, speaking with a representative of the *Electrical World*, said that this arrangement brought the factory and office into the same building. Although no increase in floor space was obtained, better unity of action can be developed with the two departments under the same roof, he pointed out.

Los Angeles Gas & Electric to Sell $5,000,000 Bonds

The Los Angeles Gas & Electric Corporation has been authorized by the Railroad Commission of California to issue and sell at not less than 92.25 per cent of their face value $5,000,000 of series "E" 5½ per cent twenty-five-year general and refunding mortgage bonds and to use the proceeds to reimburse its treasury and finance new construction. The bonds are redeemable on June 1, 1932, at a premium of 7½ per cent and on the first day of each year thereafter at a premium computed at the rate of one-half of 1 per cent each year of the unexpired term. The company reported at the hearing that it must expend $10,750,000 during the current year for additions and extensions. Of this amount, applicant announced that it expected to finance $6,473,250 through the sale of bonds and the remainder through the sale of stock and the investment of earnings.

Compensation for the electric distribution system and gas property in the city of Oroville, Cal., which that city plans to take over from the Pacific Gas & Electric Company, was fixed by the Railroad Commission. The values are determined as of Aug. 15, 1918, the date of the application. For the electric system, including lands, property and rights, compensation is placed at $90,861. The gas property is valued at $50,000. Severance damages are put at $6,177 if the city takes over only the electric system and at $1,954 if the city should acquire both properties.

Special Service Sales Starts Business in Los Angeles

The Special Service Sales Company, 502 Delta Building, Los Angeles, has been established as a manufacturers' agency for southern California and has secured representation for the Morganite Brush Company, Inc., New York City; Electric Power Equipment Corporation, Philadelphia, and Flexible Woven Cable Company, Boston. Arthur A. Barbera is manager.

Lockwood, Greene & Company Reincorporated

Under the name of Lockwood, Greene & Company, Inc., the business of Lockwood, Greene & Company of Boston has been reincorporated under the laws of Massachusetts, capitalized into $1,500,000 of 7 per cent cumulative preferred stock, $1,740,000 common stock and $200,000 class B stock. The National Shawmut Bank of Boston is the transfer agent. Shares of this preferred stock are being issued at par, $100, and accrued dividend from July 1, with a bonus of 15 per cent in class B stock, through the banking house of Jackson & Curtis, Boston.

The company began business in 1832. Its primary business, including subsidiaries, is engineering and management for industrial plants. The engineering business, while prominently identified with textiles, is not dependent on any one line of activity, but has been prosecuted throughout the entire industrial field of the country and to a certain extent abroad. There will be no change in the directors and principal officers of the corporation. Edwin Farnham Greene is president.

Buyers Ask Performance Tests for Radio Sets

"Ever-increasing public interest in radio has added to the troubles of department-store buyers and others handling such equipment," says a report just issued by the Department of Commerce. "Because of the rather technical problems involved, actual and prospective sellers of 'ether-wave' receiving devices say they are up against it in their efforts to satisfy the trade. Finding no information available to use in selecting good or rejecting bad apparatus and fearing the loss of good will, appeals have been directed to the Bureau of Standards of the Department of Commerce to devise standard testing methods.

"Performance test methods for immediate use by a commerical testing laboratory were recently agreed upon in an outline by representatives of the Bureau of Standards, the Electrical Testing Laboratories of New York and the National Retail Dry Goods Association. Suggestions regarding improvements on these methods, or new methods for testing the equipment submitted by the National Retail Dry Goods Association, will be subject to

approval of the Bureau of Standards. The tests outlined include an examination as to the materials and workmanship of construction, the mechanical and electrical design, simplicity of adjustment, ruggedness, sensitivity, sharpness of tuning, wave-length range and faithfulness of reproduction.

"The investigating committee of the National Retail Dry Goods Association has suggested that from a commerical standpoint it would be of assistance to its members if responsible manufacturers would plainly mark their equipment, indicating the receiving radius of each instrument under every atmospheric condition. Owing to the large number of factors which enter into the determination of the range over which signals can be received with a given set, this is a very difficult problem, impossible to overcome at present by a brief statement or mark."

R. W. Lillie Corporation Awarded Large Contract

The R. W. Lillie Corporation, sales engineers for the Electric Power Equipment Corporation and the Jefferry-Dewitt Insulator Company, have been awarded a contract by the Buffalo General Electric Company to furnish all disconnecting switches and bus supports for its new outdoor substation.

The design of switches and type of insulators was a matter of most serious consideration, as this station will be tied in on one of the main transmission lines of the Niagara Falls Power Company. The possibility of heavy short-circuit stresses and high-power flashovers was taken into serious consideration.

It is interesting to note that this station, which will be one of the largest outdoor types in the country, will be equipped throughout with mechanically operated switch poles gaged together so that simultaneous opening and closing of all poles is positive. Switches may be locked in both opened and closed position.

Jeffery-Dewitt heavy-duty flanged-type insulators were selected, it being feared that cement involved in other designs would crack and crumble away under vibration and mechanical impacts, as switches will be operated frequently. Flanged insulators of the Jeffery-Dewitt design can be readily removed and new units added. All switches will be upon flanged insulators, and buses will be supported by Jeffery-Dewitt suspension-type insulators.

It is interesting to note that these engineers recognized the difficulty encountered in trying to open the ordinary type of stick-operated disconnecting switch at night or under hurried conditions. Mechanically operated switches eliminate the possibilities of operators pulling the wrong switch under load and assured quick and positive operation and control of all three phases at once. Incoming lines are rated at 66,000 volts stepped down to 35,000 volts.

Electrical Development Abroad Is Reported by Department of Commerce

The Department of Commerce, reviewing the situation affecting sale of electrical goods abroad, notes that plans for the forthcoming electrification of the Southeastern & Chatham Railway to London are awaiting signatures on the company's agreement with the Trade Facilities Advisory Committee and a treasury agreement which involves a guarantee of £6,500,000, principal and interest, for twenty-five years under the trade facilities act.

There are upward of fifty hydro-electric stations in the state of São Paulo, Brazil, which supply energy to 236 cities, towns and villages, with a total development of 122,000 hp., an average of 2,400 hp. per station. In the district around Ribeirao Preto energy is supplied to more than 10,000 hp. in motors in the coffee industry.

Hydro-electric power in Italy as of Jan. 1, 1922, is reported as 1,191,797 hp. In addition to hydro-electric plants now in operation, new ones are in course of construction, of which those in Lombardy will produce 121,934 hp., and those nearing completion in Piedmont will produce 109,386 hp. Of other concessions granted, totaling about 50,000 hp., those in Umbria will produce 30,136 hp., and new central stations in Liguria will produce 688 hp.

Boston Engineering Firms Move

Effective July 1, the offices of Fay, Spofford & Thorndike, consulting engineers, 15 Beacon Street, Boston, are transferred to 200 Devonshire Street. Charles T. Main, consulting engineer, formerly at 201 Devonshire Street has also relocated at 200 Devonshire Street.

The American Abrasive Metals Company of 50 Church Street, New York City, manufacturer of "feralun," "alumalun," "vulcalun" and "bronzalun" "antislip" treads, announces its appointment by the Carborundum Company of Niagara Falls to act as United States sales representative through whom will be marketed the carborundum "antislip" tile.

The International Radio & Ignition Corporation, 225 North Michigan Avenue, Chicago, has been formed with capital stock of $100,000, with B. C. Lindly as president. The corporation's activities will consist of the manufacture and distribution of automotive ignition systems and ignition parts, radio broadcasting and receiving sets.

The Connecticut Instrument Company, Inc., Stamford, Conn., which will manufacture radio head sets and various radio and engineering devices, has leased the factory of the Lounsbury & Soule Company, of the same city. The officers of the new concerns are: R. E. Gillmor, president and treasurer; J. B. Allen, vice-president and factory manager; G. M. Fisher, secretary and sales manager; G. B. Crouse, chief engineer.

The Dryden Rubber Company, Chicago, announces that E. H. Young and H. E. Lavelle have been appointed exclusive Eastern representatives for the sale of Dryden "Double-Wear" friction tape and splicing compound in the New England and Middle Atlantic States. Their headquarters are at 18 Vesey Street, New York City.

The Black & Decker Manufacturing Company, Towson Heights, Baltimore, builder of portable electric tools, announces the establishment of a new Detroit office in the General Motors Building. C. G. Odell, assistant to the president of the company, will use this office as his base, in addition to which it will provide headquarters for the local Detroit representative.

The Wright Battery Company, manufacturer of storage batteries at Flint, Mich., is planning to increase production in its present plant to 400 batteries a day, with a view to increasing to 2,000 batteries a day in a year's time.

The J-E Battery Company of the Pacific Coast has leased quarters at 221-225 Bay Street, San Francisco, and is installing equipment for the manufacture of storage batteries, battery plates and lead parts. A department will be opened for the manufacture of battery boxes and separators. The plant is under the management of J. E. Nottingham.

The National Enameled Wire Company has been organized in Toledo, Ohio, to manufacture automobile lamps and enameled cotton-covered wire. Officers of the company are: Earl J. Sutton, president; Joseph J. Rappey, vice-president and general manager, and Harry M. Pingen, secretary.

The Westinghouse Electric & Manufacturing Company, Philadelphia, is receiving bids for the erection of a ten-story reinforced-concrete building, 95 ft. x 191 ft., at Thirtieth and Walnut streets, to be used as district headquarters, for sales, office and general operating service.

The General Electric Company will soon construct a new building, to be known as No. 99, at the Schenectady Works. This will make 311 buildings grouped within 438 acres of land. The new structure, which will be of steel, will be used exclusively for storing electrical machinery originally begun for the Navy Department. Contracts for this apparatus were recently canceled under terms of the disarmament program.

The Postal Telegraph-Commercial Cables System has purchased from the government of Newfoundland the submarine cable extending from Canso, Nova Scotia, to Newfoundland, according to an announcement just made by Clarence H. Mackay, president of the Company.

Robert O. Craig, for the past three years with Michael & Bivens, electrical contractors of Gastonia, N. C., announces that he has severed his connection with that firm and has purchased the business of Lineberger & Thomasson of the same city.

Foreign Trade Notes

NEW INDUSTRIAL PLANT IN SHANGHAI, CHINA.—A new enterprise known as the China International & Engineering Manufacturing Company, Ltd., has been organized at Shanghai to manufacture electrical machinery and supplies. The company is capitalized at $300,000 and is a purely Chinese enterprise, and its products are to be marketed in China. American and German machinery and equipment are said to be have been ordered.

EXTENSION OF ONTARIO HYDRO-ELECTRIC SYSTEM TO MUNICIPALITIES.—Last year the Ontario Legislature passed an act authorizing the government to bear 50 per cent of the cost of extending primary distribution lines of the Hydro-Electric Commission in rural districts, but in a bill introduced this year, the *Electrician* states, this privilege will be extended to municipalities that may be in a position to purchase energy from private companies. It is not intended to allow a rebate to a private company that may be erecting rural primary lines, but a township or a group of farmers may build primary lines and own them, the government paying 50 per cent of the cost. A bill has also been introduced into the Ontario Legislature dealing with the construction and operation of municipal electric railways, which provides that the corporations of two or more municipalities in any locality in which electrical energy is supplied by the Hydro-Electric Commission the latter, as the agent of and at the expense of such corporations, may investigate the cost and the advisability of constructing the desired railway.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

A mercantile firm in Sweden (No. 2,575) wishes to purchase electrical articles, agricultural machinery, etc.

An agency is desired from manufacturers by a firm in South Africa (No. 2,583) for the sale of X-ray apparatus and wireless telegraphic equipment.

The purchase is desired by a company in England (No. 2,584) of twenty-five wireless receiving sets, less valves and telephones.

A company in England (No. 2,623) desire to secure an agency from manufacturers for the sale of a complete radio-telephone receiving apparatus.

An engineering firm in Finland (No. 2,625) wishes to purchase an agency for all kinds of electrical materials, machines, copper, porcelain, etc.

An American firm organized for trade promotion in India (No. 2,643) desires to be placed in communication with manufacturers and exporters for the sale of steam power plants, electric generators and motors, pumps for water supplies and irrigation works, oil engines, mechanical specialties, etc.

A municipality in Canada (No. 2,659) is in the market for 3,500 ft. of vitrified six-hole conduit, or 21,000 ft. fiber, one-hole conduit, and accessories for underground street wiring; twelve manhole covers; 105,000 ft. of No. 2, 50,000 ft. of No. 4, 25,000 ft. of No. 6, and 25,000 ft. of No. 8 lead-covered copper standard cable.

A firm in Sweden (No. 2,670) desires to secure agencies for the sale of all articles in the electrical line, machine tools, etc.

A merchant in Italy (No. 2,675) desires to secure an agency for the sale of insulating material, etc.

PROPOSED EXTENSIONS TO ELECTRIC PLANT AT JOHANNESBURG, SOUTH AFRICA.—The corporation of Johannesburg, according to the *Electrician*, has decided to extend the electric transmission lines to the suburbs, involving an expenditure of about £35,000.

ELECTRIC PLANT FOR SALISBURY, SOUTH AFRICA.—The Municipal Council of Salisbury, South Africa, the *Electrician* states, has raised a loan of £70,000, of which £30,000 will be used for improvements to the electric generating plant.

PROPOSED ELECTRIC PLANT FOR CALEDON, SOUTH AFRICA.—Tenders will be received by the Municipal Council, Caledon, Cape Province, the *Electrical Review* states, until Aug. 9 for the installation of an electric lighting system, for which plans were prepared by Prof. Bohle of the University of Cape Town.

EQUIPMENT FOR ELECTRIC PLANT AT ROBERTSON, SOUTH AFRICA.—Tenders will be received by the municipality of Robertson, South Africa, according to the *Electrician*, until Aug. 14 furnishing and installing two 75-kw. steam-driven generating sets and equipment for power station (Contract No. 1); one 300-amp.-hr. battery (Contract No. 2), and material for outside distribution system (Contract No. 3).

New Apparatus and Publications

"UNA-FLOW" STEAM ENGINE.—The second edition of "The Una-Flow Steam Engine" has been published and is a complete revision of the first, little of which remains. It contains 319 pages, in which a scientific proof from an objective point of view is given of the accomplishment of the "Una-Flow" engine as well as a description of its development. Prof. J. Stumpf, Berlin, is author of the book, which was translated by the Stumpf Una-Flow Engine Company, Inc., Syracuse, N. Y.

RADIO APPARATUS PARTS.—The Ajax Electric Specialty Company, Ajax Building, 1011 Market Street, St. Louis, announces that it has placed on the market a line of radio apparatus.

RADIOPHONE HEAD SET.—The Delta Electric Company, Marion, Ind., has recently developed a new radiophone head set known as the "Delta Gold Stripe."

SMALL STEAM TURBINES.—The Allis-Chalmers Manufacturing Company, Milwaukee, has issued bulletin No. 1,123, entitled "Small Steam Turbine," covering its line of turbines suitable for driving condenser auxiliaries, exciters, small generators, etc.

POLYPHASE TRANSFORMERS.—The Pittsburgh Transformer Company, Pittsburgh, Pa., is distributing bulletin No. 2,015, describing its new polyphase transformer.

TRANSFORMER LOAD INDICATOR.—A transformer load indicator for determining the load of distribution and for many other purposes is being manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

ELECTRIC REFRIGERATOR.—The Icenomor Electric Refrigerator Company, Evansville, Ind., is distributing an eight-page pamphlet describing the "Icenomor" electric refrigerator.

MICARTA GEARS AND PINIONS.—Circular 1,579-B, issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., contains general information regarding "Micarta," a non-metallic material, developed by the company for gear and pinion application.

OIL CIRCUIT BREAKER.—A new type of oil circuit breaker, known as type O-1, has been brought out by the Conduit Electrical Manufacturing Company, Boston, 27, Mass. These breakers are built for 15,000 volts to 25,000 volts, up to and including 600 amp.

RADIO TELEPHONE RECEIVERS.—The Roller-Smith Company, 233 Broadway, New York City, is distributing bulletin No. 20, covering its "Universal" radio telephone receivers, type "A," 2,700 ohms per pair, and type "B," 2,000 ohms per pair.

New Incorporations

THE ELK UTILITY COMPANY, Clay, W. Va., has been incorporated with a capital stock of $25,000 by Parley D. Barry, S. W. Brant and James Reed.

THE OCEAN BEACH (N. Y.) GAS & ELECTRIC CORPORATION has been incorporated with a capital stock of $50,000 by J. A. and J. A. Wilbur and J. H. Hallock.

THE HOLDCRAFT ELECTRIC COMPANY, Hazard, Ky., has been incorporated with a capital stock of $20,000 to construct and operate an electric plant in a town in the southeastern part of Kentucky. A. D. Holdcraft is president and manager.

THE SCHIFFL RADIO & ELECTRIC CORPORATION, 156 Market Street, Newark, N. J., has been incorporated to manufacture radio sets and parts. The officers are: Charles Schiffl, president; Frank Schiffl, vice-president; Paul D. Potter, treasurer; Ogden Childe, secretary, and George Henry Nolte, chairman of board.

Electrical Patents

Announced by U. S. Patent Office

(Issued June 6, 1922)

1,418,671. ELECTRICALLY CONTROLLED HEATER; C. E. Patterson, San Francisco, Cal. App. filed Nov. 17, 1920. Room heater.

1,418,702. ANNUNCIATOR; W. T. Dippel, New York, N. Y. App. filed May 5, 1920.

1,418,707. CONSTANT-CURRENT GENERATOR FOR ARC WELDING; Klaus L. Hansen, Milwaukee, Wis. App. filed June 27, 1921. Auxiliary winding for distorting main field.

1,418,726. ELECTRIC CURRENT CONTROLLER; E. Naether, Veney, Switzerland. App. filed April 4, 1921. Prevents using more than a predetermined amount of power.

1,418,729. PORTABLE RADIATING SYSTEM; A. A. Oswald, East Orange, N. J. App. filed April 25, 1919. Wireless antennas for airplanes.

1,418,739. OSCILLATION GENERATOR; E. O. Scriven, New York, N. Y. App. filed June 4, 1917. Vacuum-tube oscillator.

1,418,764. ATTACHMENT FOR TELEPHONE HOOK SWITCHES; H. L. S. Williams, Montreal, Que., Can. App. filed Nov. 19, 1920. For rural-service lines.

1,418,773. METALLURGICAL FURNACE; W. K. Booth, Chicago, Ill. App. filed Dec. 3, 1919. Lining composed of molded cylinder.

1,418,779. DYNAMO-ELECTRIC MACHINERY; F. Creedy, Ilkley, England. App. filed Feb. 11, 1919. Phase-changing apparatus.

1,418,833. TROLLEY WHEEL; F. N. Russell, Elmira, N. Y. App. filed Nov. 2, 1921. Flanges separate from main body.

1,418,834. MANUFACTURE OF GRID RESISTANCES; L. Satchwell, Burry Port, Caermarthen, Wales. App. filed Oct. 18, 1920. Produced from stamped sheet metal.

1,418,856. DYNAMO-ELECTRIC MACHINE; R. B. Williamson, Milwaukee, Wis. App. filed May 2, 1919. Insulating of armature coils.

1,418,857. DYNAMO-ELECTRIC MACHINE; R. B. Williamson, Milwaukee, Wis. App. filed April 5, 1920. Slip-ring connections for revolving field.

1,418,903. ELECTROMAGNETIC WAVE BATH; W. S. Benson, Newark, N. J. App. filed Sept. 14, 1921. For treating cells of body.

1,418,917. ELECTRIC HEATER; W. W. Hale, Cleveland, Ohio. App. filed Jan. 31, 1920. Corrugated element between insulating sheets.

1,418,969. CALL ANNUNCIATOR; H. F. Plumb, Drumheller, Alberta, Can. App. filed Oct. 15, 1918. Gives visual and audible signal.

1,418,977. ELECTRIC LOCOMOTIVE; L. Schon, Essen-on-the-Ruhr, Germany. App. filed Dec. 7, 1920. Gasoline electric car.

1,418,984. ELECTRIC FURNACE; F. W. Sperr, Jr., and H. J. Rose, Pittsburgh, Pa. App. filed March 14, 1921. For heating and testing coal samples.

1,418,989. ELECTRICAL CONNECTING DEVICE; G. C. Thomas, Jr., Elizabeth, N. J. App. filed Nov. 21, 1919. For connecting conduits to outlet boxes.

1,418,990. CONNECTOR FOR ELECTRICAL CONDUITS, ETC.; G. C. Thomas, Jr., Elizabeth, N. J. App. filed Nov. 10, 1920. For connecting conduits or cables to outlet boxes.

1,419,010. REPEATER FOR GYROCOMPASSES; S. G. Brown, North Acton, England. App. filed April 17, 1919. Operated from master compass by air jet.

1,419,063. APPARATUS APPLICABLE TO THE RECEIVERS OF TELEPHONES; F. S. Lamadrid, Madrid, Spain. App. filed May 23, 1919. Protects receiver against interference.

1,419,071. SELF-REGULATING CONTINUOUS-CURRENT DYNAMO; A. H. Midgley, Acton Vale, England. App. filed Dec. 21, 1918. Armature conductors under lagging pole tips shorted by brushes.

(Issued June 13, 1922)

1,419,153. PROCESS AND APPARATUS FOR BENDING LAMP FILAMENTS; A. Lederer, Vienna, Austria. App. filed Dec. 30, 1914.

1,419,173. ELECTRIC IRON; J. M. Seche, Philadelphia, Pa. App. filed Jan. 24, 1922. Attachment on heel to raise iron when not used.

1,419,178. CONTROLLER FOR ELECTRIC MOTORS; H. W. Stevens, Milwaukee, Wis. App. filed Dec. 26, 1919. For dynamic braking.

1,419,208. STORAGE-BATTERY COVER; Earle A. Berry, Kansas City, Mo. App. filed April 21, 1922.

1,419,225. WATER HEATER; W. Colebrook, Durban, Natal, South Africa. App. filed Sept. 20, 1920. Water heated in continuous stream.

1,419,241. X-RAY CABINET; E. L. Edwards, Indianapolis, Ind. App. filed Jan. 24, 1919. Protective inclosure and dark room for developing negatives.

1,419,256. ELECTRIC LIGHT DISPLAY SYSTEM; J. H. Hammond, Jr., Gloucester, Mass. App. filed Dec. 27, 1916. Produces effect of moving pictures.

1,419,309. ELECTRICAL HEATING DEVICE; T. C. Russell, Chicago, Ill. App. filed March 23, 1921. Grill plate.

1,419,330. ELECTRIC HEATER; F. G. Van Dyke, Detroit, Mich. App. filed Dec. 19, 1921. Room heater.

1,419,360. ELECTROLYTIC LIGHT SOURCE; John Coulson, Wilkinsburg, Pa. App. filed Nov. 3, 1917. Electric current passed through electrolyte and film of aluminum hydroxide.

1,419,365. TROLLEY HARP; M. P. Enyeart, Girard, Ohio. App. filed Aug. 11, 1921. Wheel always parallel to wire.

1,419,376. WIRELESS CONTROL APPARATUS; J. H. Hammond, Jr., Gloucester, Mass. App. filed Nov. 27, 1909. Controlling vehicles, vessels, etc., from a distance.

1,419,377. RADIODYNAMIC OCCULTING SYSTEM; J. H. Hammond, Jr., Gloucester, Mass. App. filed Aug. 1, 1913. Varying path of artificial light emissions by radiant energy.

1,419,396. STORAGE BATTERY; F. G. Manwaring, Campgaw, N. J. App. filed May 25, 1920. Each plate in perforated stone compartment.

1,419,403. LOCKOUT MECHANISM FOR INTERCOMMUNICATING TELEPHONE SYSTEMS; T. H. Nelson, Chicago, Ill. App. filed Oct. 21, 1918. Combined selecting, switching and lock-out mechanism.

1,419,409. SYSTEM OF TELEGRAPH DISTRIBUTION; L. M. Potts, Baltimore, Md. App. filed Feb. 5, 1920. Single-trunk line for independent communication between selected pairs of stations.

1,419,421. ANTI-HUNTING REGULATOR SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed April 9, 1919. To maintain constant load on pulp-grinder motor.

1,419,422. ANTI-HUNTING REGULATOR SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed April 18, 1919. To maintain constant load on pulp-grinder motor.

1,419,458. VOLTAGE REGULATOR SYSTEM; Edwin Lehr, Wilkinsburg, Pa. App. filed June 25, 1919. Auxiliary transformer with two floating coils replacing induction regulator.

1,419,460. COMBINED KEY AND SWITCH; F. Lowenstein, Brooklyn, N. Y. App. filed Nov. 29, 1918. Wireless key rotates over number of contacts for sending different wave lengths.

1,419,493. ELECTRIC REGULATION; J. L. Creveling, White Plains, N. Y. App. filed March 8, 1916. For train generator-storage battery system.

1,419,494. ELECTRIC REGULATION; J. L. Creveling, White Plains, N. Y. App. filed May 2, 1916. For train generator-storage battery systems.

1,419,511. SEALING STRUCTURE FOR STORAGE-BATTERY TERMINAL POSTS; P. E. Norris, Wilkinsburg, Pa. App. filed March 9, 1921. Gasket and flange arrangement wedged around post.

1,419,513. TELEPHONE MOUTHPIECE; Herman G. Pape, New York, N. Y. App. filed Sept. 11, 1919.

1,419,523. METHOD OF AND MEANS FOR JOINTING ELECTRIC CURRENT CONDUCTORS; J. F. Schleper, Amsterdam, Netherlands. App. filed April 20, 1922. Twisted conductors placed in clamping cap.

1,419,528. ELECTRON-DISCHARGE DEVICE; H. W. Weinhart, Elizabeth, N. J. App. filed Oct. 25, 1918. Electrode support for electron tube.

1,419,530. THERMIONICALLY ACTIVE SUBSTANCE; William Wilson, East Orange, N. J. App. filed Aug. 12, 1918. Electron-tube filament of nickel coated with strontium and barium oxides.

1,419,547. ELECTRONIC APPARATUS; C. D. Ehret, Philadelphia, Pa. App. filed Nov. 12, 1918. Tubes for radio circuits.

1,419,551. TELEPHONE ACCESSORY; J. Fleischman, New York, N. Y. App. filed May 22, 1920. Head set for desk telephone.

1,419,559. ELECTROMAGNETIC DEVICES; Harold W. Goff, New York, N. Y. App. filed Feb. 6, 1919. Electromagnetic relays and step magnets.

1,419,561. SWITCHING SYSTEM; J. B. Harlow, Upper Montclair, N. J. App. filed June 24, 1919. Submerged vibration detector.

1,419,562. MODULATOR OR DETECTOR; R. V. L. Hartley, East Orange, N. J. App. filed Sept. 29, 1919. Balanced modulator using two-three electrode tubes.

1,419,569. TELEPHONE EXCHANGE SYSTEM; C. W. Keckler, Newark, N. J. App. filed Oct. 30, 1917. Central-energy type.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

MONTPELIER, VT. — The Vermont & Quebec Power Corporation has issued $300,000 in bonds, part of the proceeds to be used for extensions, etc.

AMESBURY, MASS. — The Amesbury Electric Light Company has applied to the State Department of Public Utilities for permission to issue $81,000 in capital stock, part of the proceeds to be used for extensions, etc.

LOWELL, MASS.—Mayor Brown has requested the Lowell Electric Light Corporation to draw up a plan for extending the ornamental lighting system into some streets surrounding the "downtown" section of the city.

MONSON, MASS.—Ricketts & Shaw contemplates building a power plant in connection with their local woolen mill. Reeds & Thorpe, Prospect Street, Hartford, Conn., are architects.

NORTON, MASS.—The Norton Power & Electric Company has petitioned the Department of Public Utilities for approval of an issue of $310,000 in capital stock to be used to pay for extensions to its plant.

WINCHENDON, MASS.—The Winchendon Electric Light & Power Company has petitioned the Department of Public Utilities for permission to issue $53,000 in capital stock, the proceeds to be used to pay the cost of extensions, etc.

MILFORD, CONN.—Plans are under consideration for the installation of ornamental lamps on Bridgeport Avenue from Avon Street to the bridge.

TORRINGTON, CONN.—The Torrington Electric Light Company is planning the construction of a boiler room.

Middle Atlantic States

COHOES, N. Y.—Bids will be received by the Superintendent of Public Works until July 10 for equipment for the proposed power house at Crescent Dam, Cohoes, including two hydraulic turbines, with governor equipment; two waterwheel-driven generators and auxiliary equipment.

NEW LEBANON, N. Y.—A franchise has been granted to the Lebanon Valley Lighting Company, Canaan, to supply electricity in New Lebanon.

NEW YORK, N. Y.—The New York Edison Company will build a substation at 454 East Twenty-seventh Street, to cost about $25,000.

TRENTON, N. J.—The Public Service Electric Company will build a station on North Olden Avenue, to cost about $25,000.

GREENVILLE, PA. — Negotiations are under way for a merger of the Mercer County Light, Heat & Power Company, the Pennsylvania-Ohio Electric Company and the Northwestern Electric Company, Erie, Pa. A system of transmission lines will be erected, including a line from Greenville to New Wilmington, and to other sections in Eastern Ohio.

HAZLETON, PA.—The Wilkes-Barre & Hazleton Railway Company has contracted with the Pennsylvania Power & Light Company for electricity to operate its interurban lines from Hazleton to Wilkes-Barre.

PHILADELPHIA, PA. — A one-story power house will be erected at the new iron-working plant at Erie and D Streets, to be established by Horace T. Potts & Company, 316 North Third Street.

PITTSBURGH, PA. — The West Penn Company has issued $2,500,000 in bonds, the proceeds to be used for acquiring the property of the Monongahela Power & Railway Company and also for plant extensions, etc.

TEXAS, MD. — The Maryland Calcite Company, P. O. Box 102, will construct a power house in connection with its proposed mill for the manufacture of whiting, marble flour, etc. R. L. Lovell, president.

FAIRMONT, W. VA.—The West Virginia & Maryland Power Company is considering the erection of an electric transmission line in the Winfield district.

HUNTINGTON, W. VA.—The Consolidated Light, Heat & Power Company contemplates building a 50,000-kw. substation in the east end of the city, to cost about $90,000.

MORGANTOWN, W. VA.—Power plant equipment, electric pumping machinery, etc., will be installed in connection with the proposed new sewer system, to cost about $750,000.

NITRO, W. VA.—The Charleston Paper Manufacturing Company is preparing plans for the construction of a power house at its proposed local paper mill. Charles G. Hartje, Steubenville, Ohio, is president.

PEACH CREEK, W. VA.—The Chesapeake & Ohio Railroad Company, Richmond, Va., will build a power plant in connection with its local shops. F. I. Cabell is chief engineer.

LURAY, VA.—The Page Power Company, which recently purchased the property of the Luray Light & Power Company, is preparing to build a hydro-electric plant on the Shenandoah River at Newport, 10 miles south of Luray. The proposed plant will have a capacity of 1,800 hp. and will supply electricity in Elkton, Shenandoah, Stanley and Luray. The cost of the project is estimated at $200,000. M. E. Roundabush, Stanley, is president and treasurer.

RADFORD, VA.—Plans are being prepared for the construction of a municipal electric light plant, for which $115,000 in bonds have been voted.

ROANOKE, VA. — The National Soap Stone Company, First National Bank Building, will build a one-story power house at its plant.

SCOTTSVILLE, VA.—The Big Ben Power Company has engaged the Ambler Engineering Company, Richmond, to prepare plans for its proposed hydro-electric power plant on the James River, to cost about $750,000, including transmission system. A reserve reservoir and system will be built to cost about $1,000,000.

WASHINGTON, D. C.—Bids will be received by the purchasing agent, Post Office Department, until July 5 for 4,000 sets of commutator wire assemblies.

North Central States

CASEVILLE, MICH. — The Council has authorized the installation of an electric distributing system. Service will be furnished by the Central Power Company with line connection at Bad Axe.

DOWAGIAC, MICH. — Extensions are being made to the municipal electric light plant, to cost about $10,000.

HOLT, MICH.—The Consumers' Power Company contemplates extending its lines to the town of Holt to supply electrical service.

ST. JOSEPH, MICH.—The Indiana & Michigan Electric Company contemplates the construction of a dam at King's Landing, 5 miles above St. Joseph. The proposed dam will be 17 ft. high and 500 ft. long and will flood about 2,000 acres.

THREE RIVERS, MICH.—The Michigan Gas & Electric Company has completed plans for a local power plant, to cost about $125,000. The power plant at Constantine will also be enlarged at a cost of about $45,000.

YOUNGSTOWN, OHIO. — Arrangements have been made whereby the Pennsylvania-Ohio Power & Light Company will erect 15 miles of transmission lines to supply electricity in the towns of Vienna, Hartford and Brookfield.

GREENUP, KY. — The United States Engineers, District No. 2, Room 513, Government Building, Cincinnati, Ohio, will soon ask for bids for the construction of a power house on the Ohio River at Dam No. 30, to cost about $50,000.

PRINCETON, IND.—The Indiana Power Company, Vincennes, is negotiating for the purchase of the property of the Princeton Light & Power Company. The city lighting plant at Oakland, Ind., will also be acquired by the Indiana company. Both properties, it is understood, will be extended and improved and connected with the main transmission system.

AURORA, ILL.—The Chicago, Burlington & Quincy Railroad, 546 West Jackson Boulevard, Chicago, will take bids at once for the construction of a power plant at Broadway and Washington Street, to cost about $100,000. William T. Krausch is architect.

URBANA, ILL.—Bids will be received at the office of James M. White, supervising architect, 256 Administration Building, Urbana, until July 17 for heating, and

ventilating, plumbing and electrical work on the new agricultural building to be erected for the University of Illinois.

WAUKEGAN, ILL.—The Public Service Company of Northern Illinois, 72 West Adams Street, Chicago, is preparing plans for the first unit of a new steam-driven electric plant here, to cost about $1,000,000.

MADISON, WIS.—The erection of a large chimney, to cost about $14,000, is under consideration by the Madison Gas & Electric Company.

MELLEN, WIS.—An ornamental lighting system will be installed on Main and Bennett Streets.

PESHTIGO, WIS.—Improvements will be made to the plant of the Peshtigo Electric Company, including rebuilding a portion of its dam, erection of an addition to power house (to provide space for an additional unit, etc.). The cost is estimated at $60,000.

SHEBOYGAN, WIS.—Bids are being received by E. A. Juhl, architect, 805 North Eight Street, for a power station and engine house on Twelfth Street, for the Phoenix Chair Company, to cost with equipment about $40,000.

STURGEON BAY, WIS. — Surveys are being made by the Wisconsin Public Service Company, Green Bay, for the erection of an electric transmission line from Sturgeon Bay to Ellison Bay. The plans call for the organization of a company, to be capitalized at $50,000, to supply electricity to towns along the line, including Egg Harbor, Fish Creek, Sister Bay and Ellison Bay.

WAUSAU, WIS.—The Wisconsin Valley Electric Company is planning to replace the present lines between Wassau and Mosinee and between Stevens Points and Junction City (a total of 67 miles) with heavier copper wire to provide for the increasing demand for electricity for power purposes. The cost is estimated at about $20,000.

CANBY, MINN.—The Union Public Service Company will begin work at once on rebuilding its local plant, to cost about $200,000.

EVELETH, MINN. — The Minnesota Utilities Company has acquired property and water rights on the Kawishiwi River, near Ely, where it will construct a hydro-electric plant to develop about 12,000 hp. The cost of the proposed plant and transmission system is estimated at about $1,750,000. R. M. Heskett is secretary and manager.

DUBUQUE, IOWA—Council has authorized plans for extensions and improvements to the electrically operated pumping station at the water works, to cost, including equipment, about $135,000. Mead & Seatone, Madison, Wis., are engineers.

MANCHESTER, IOWA.—The Iowa Electric Company will build a hydro-electric plant in Manchester to supply electricity to a number of towns in Delaware County. The cost is estimated at $40,000.

MEXICO, MO. — The Missouri Utilities Company is planning to erect a transmission line from Mexico to Paris and Hallsville.

ST. LOUIS, MO.—A power house will be constructed at the convent of the Little Sisters of the Poor, 3,400 South Grand Avenue, to cost about $30,000. Lee & Rusch, Syndicate Trust Building, are architects.

SPRINGFIELD, MO. — The Springfield Gas & Electric Company is preparing plans for the erection of a steam-driven electric plant, to cost about $1,000,000. Sanderson & Porter, 52 William Street, New York, are engineers.

WHITE RIVER, S. D.—The local electric plant has been taken over by the town, to be owned and operated by the municipality.

BEAVER CITY, NEB.—The Council will make extensions and improvements to the municipal electric system.

OMAHA, NEB.—The Metropolitan Utilities District will install electric pumping machinery and make improvements in present pumping equipment, to cost about $250,000, in connection with extensions in the local water works, to cost about $1,500,000. F. D. Wead, chairman.

WAHOO, NEB.—A bond issue of $30,000 has been voted for extensions and improvements to the municipal electric system.

ARKANSAS CITY, KAN.—The Arkansas Valley Interurban Railway Company contemplates the construction of a substation in connection with the extension of its line to Ponca City, Okla.

KANSAS CITY, KAN.—The Baum Packing Company will build a one-story addition to its power house, 28 ft. x 40 ft.

LANSING, KAN.—Plans have been completed for a one-story power house at the State Penitentiary.

LEAVENWORTH, KAN.—The Kansas Electric Power Company has issued bonds for $3,000,000, part of the proceeds to be used for extensions and improvements.

Southern States

ASHEVILLE, N. C. — The Carolina Power & Textile Company, recently organized, contemplates the construction of a series of five hydro-electric plants for textile mill service, three to be located on the South Fork of the Mills River, one on the Davidson River, and one on Rocky Fork. The plants will have a combined capacity of about 12,000 hp. and cost about $200,000.

CUMNOCK, N. C. — The Rocky River Power & Light Company, High Point, is having plans prepared for the first unit of a hydro-electric power plant on the Rocky River, to include the erection of a 13,000-volt transmission line. A second unit will be installed at an early date. Mees & Mees, Kinney Building, Charlotte, are engineers.

GASTONIA, N. C.—An electric power plant will be installed by the Ruby Cotton Mills, Inc., in connection with its proposed local mill. James A. Page, Clover, S. C., is president.

ATHENS, GA. — The Wellman Cotton Mills Company will build a power house in connection with its proposed local mill. Shelby Fletcher is president.

TALLAHASSEE, FLA.—The West Florida Power Company has applied to the Secretary of State for a charter. The company is to be capitalized at $1,000,000 and it proposes to develop water power on the Ocklocknee River to generate electricity. Its headquarters will be in Tallahassee. The incorporators are B. H. Hardaway, Sr., B. H. Hardaway, Jr., C. A. Mees and Guy L. Winthrop.

KNOXVILLE, TENN. — The Silk Tie Knitting Company will erect a power house in connection with its new local mill. V. H. Spruill is president.

DOTHAN, ALA.—Bids will be received by the Mayor and City Council until Aug. 15 for the construction of a hydro-electric project at High Bluff, on the Choctawhatchee River, about 8 miles from Hartford, which include an earth dam, power house, furnishing and installing turbine, generators, transformers and auxiliary power equipment for an installation of about 3,000 hp. capacity in two units and a 44,000-volt transmission line 21½ miles long. The Ludlow Engineers, Inc., Winston-Salem, N. C., are engineers.

BRISTOW, OKLA.—The installation of an ornamental lighting system in the business district is under consideration by the Chamber of Commerce.

KETCHUM, OKLA. — The Grand River Electric Company, it is reported, has started preliminary work on its proposed plant in Ketchum. The plans provide for a development of 135,000 hp., to cost about $20,000,000.

WILBURTON, OKLA.—Bids will be received by the City Clerk until July 10 for electrical equipment in connection with waterworks extensions, as follows: Additions to power house; one 125-kw. oil-engine generator set, complete with switchboard, wiring, etc.; resetting one 500-gal.-per-minue motor-driven high-service centrifugal pumping unit; two 500-gal.-per-minute motor-driven low-service centrifugal pumping units, and one 350-gal.-per-minute high-service pumping unit, installed complete. V. V. Long & Company, Colcord Building, Oklahoma City, are engineers.

BROWNFIELD, TEX.—An election will be held July 21 to vote on the proposal to issue $16,000 in bonds for the installation of an electric lighting system.

DALLAS, TEX.—The Board of Commissioners contemplates the installation of an ornamental lighting system in the Oak Cliff section. Concrete standards are being considered. Ornamental lighting systems will also be installed on Jefferson and Beckley Avenues.

KAUFMAN, TEX.—The Council contemplates the installation of a municipal electric plant.

LEAGUE CITY, TEX.—James E. Matthews and J. E. Berry have applied to the Board of Commissioners of Galveston County for a franchise to erect and operate an electric transmission line from the plant of the Houston-Galveston Interurban Railway Company to League City to supply electricity here.

QUANAH, TEX.—The Quanah Light & Ice Company will make extensions to its electric plant to cost about $30,000. A transmission line will be erected to Eldorado, where a contract has been secured for electrical service.

TIMSON, TEX.—Work will soon begin on the construction of a municipal light and power plant.

Pacific and Mountain States

OLYMPIA, WASH.—Bids will be received by the City Clerk until July 5 for the installation of an ornamental lighting system on Main Street.

PORTLAND, ORE.—The Portland Railway, Light & Power Company will construct a two-story substation at 310 Knott Street. The Hurley-Mason Company, Gasco Building, is architect.

ROSEBURG, ORE.—The City Council has decided to install a new lighting system in the business district to replace the cluster lamps now in use. Ornamental standards mounted with single lamps will be used.

GLENDALE, CAL.—A power house will be installed in connection with the proposed vocational and manual arts building at the new Union High School, to cost about $600,000. John C. Austin, Baker-Detwiler Building, Los Angeles, is architect.

LOS ANGELES, CAL.—Bids will be received by the Public Service Commission, Public Service Building, until July 14 for motor-generator sets and oil switches for municipal power plants. (Specification No. P-275.)

MARYSVILLE, CAL.—Arrangements are being made by the Yuba Development Company for the construction of a dam and power house at Bullard's Bar, to cost about $900,000.

OAKLAND, CAL.—The Pennzoil Company will build a power house in connection with its proposed oil works on Powell Street near San Pablo Avenue.

MINIDOKA, IDAHO. — The Minidoka Mutual Electric Company has recently been organized to supply electricity in Minidoka and vicinity. The company proposes to purchase electricity from the United States Reclamation Service for distribution.

BOULDER, COL.—The Western Light & Power Company contemplates the construction of a new transmission system to Estes Park, also other line extensions and improvements.

DENVER, COL. — The Denver & Rio Grande Railroad will rebuild the power house at its Burnham shops, West Denver, recently damaged by fire.

DURANGO, COL.—The Western Colorado Power Company has appropriated $150,000 for extensions to its system in the southwestern part of the state.

Canada

CHARING CROSS, ONT.—The installation of a municipal electric lighting and power distribution system, to cost about $30,000, in Raleigh Townships is under consideration. A. Lawlor, 190 University Avenue, Toronto, is engineer.

CHIPPAWA, ONT.—The Hydro-Electric Power Commission of Ontario is planning to rebuild the local transformer station, recently destroyed by fire, causing a loss of about $200,000. Prices, it is said, are wanted on five transformers.

GLENCOE, ONT.—The Wabash Railway Company, Exchange Building, St. Louis, Mo., contemplates the erection of a water filling station, 3 miles of pipe line and electrically driven pumping equipment here. O. W. Carrick, care Wabash Railway Company, Decatur, Ill., is engineer.

KIMBERLEY, ONT.—The Consolidated Mining & Smelting Company, Ltd., Montreal, Que., has contracted with the East Kootenay Power Company for power supply to operate its new concentrating plant in the vicinity of Kimberley. Service will be furnished from the Bull River power plant.

MERLIN, ONT.—Preparations are being made by the Hydro-Electric Power Commission for the erection of a new transmisssion line to Merlin.

NEW SARUM, ONT.—Plans are being prepared for the erection of a municipal electric light and power distribution system in Yarmouth Township and a transmission line from New Sarum to St. Thomas, to cost about $27,000. A Caughell, office of Hydro-Electric Commission of Ontario, St. Thomas, is engineer.

PEMBROKE, ONT.—The Pembroke Electric Light Company has awarded contract for the construction of a dam at High Falls on the Black River.

TARA, ONT. — The officials of Derby Township are considering the installation of an electric light and power distribution system, to cost about $35,000. A. Purcell, 190 University Avenue, Toronto, is engineer.

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